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TABLE OF CONTENTS

	PAGE
Statistics*	493
Genetics*	495
Variations, Modifications, Mutations	498
Cytology*	499
Agriculture	509
Diseases, Injuries, Bacteria, Fungi, Viruses*	509
Crop Plants	520
Cereals	547
Wheat	553
Buckwheat	564
Oats	564
Rye	566
Maize	567
Barley	575
Millet and Sorghums	578
Rice	580
Other Cereals	584
Forage Grasses	584
Leguminous Forage Plants	586
Roots and Tubers	590
Fibres	596
Sugar and Starch Plants	605
Stimulants	612
Minor Crop Plants	618
Fruits and Nuts	621
Forestry.. .. .	631
Vegetables	635
Book Reviews	654

N.B.—Initialed review is written by the following:—

Dr. J. Wishart J. W.

* General studies, see also individual crops.

Plant Breeding Abstracts

Vol. XXIII, No. 4

*STATISTICS

2292 COCHRAN, W. G.

The χ^2 test of goodness of fit.

Ann. Math. Statist. 1952 : 23 : 315-45.

This paper contains "an expository discussion of the χ^2 test of goodness of fit, intended for the student and user of statistical theory rather than for the expert." After an historical section in which the results which have been obtained are outlined, practical difficulties in connexion with the test are considered. Three further sections discuss the utility of the test, alternative tests for similar purposes and tests supplementary to χ^2 .

2293 JESSOP, W. N.

One line or two ?

Appl. Statist. 1952 : 1 : 131-37.

A general survey is made of recent work on the estimation and interpretation of regression lines and functional relationships.

2294 DAVID, F. N. & JOHNSON, N. L.

The truncated Poisson.

Biometrics 1952 : 8 : 275-85.

The truncation considered is that of the zero class. Three problems are discussed, (i) test of the hypothesis that the sample distribution comes from a Poisson distribution with the zero class removed, (ii) the estimation of the parameter in the event of the hypothesis being accepted and (iii) the estimation of the parameters when the hypothesis is rejected and a negative binomial distribution with similar truncation is used.

2295 FISHER, R. A.

Sequential experimentation.

Biometrics 1952 : 8 : 183-87.

This paper includes two examples of sequential experiments: one with the object of securing mice of a particular genetical structure and one on the improvement of milk yield of cattle. The first leads to a test related to the familiar Wald type; the second is discussed only in outline.

2296 BOX, B. E. P.

Multi-factor designs of first order.

Biometrika 1952 : 39 : 49-57.

A measurable response, such as a yield, is

influenced by k quantitative variables in such a way that the regression surface is planar. The problem considered in this paper is that of the allocation of the N combinations of levels among N experiments in order to determine the plane with greatest accuracy, subject to certain constraints on the extent of variation of the factors. It is shown that a wide class of designs are optimum, and choice amongst these may be made in order to eliminate possible biases due to second-order effects or to eliminate trends over the period of experimentation. The possible advantages of randomization are also discussed.

2297 BOSE, R. C. & SHIMAMOTO, T.

Classification and analysis of partially balanced incomplete block designs with two associate classes.

J. Amer. Statist. Ass. 1952 : 47 : 151-184.

A review is given of the more important properties of partially balanced incomplete block designs with two associate classes. The intra-block and combined intrablock and interblock analyses are described and illustrated with a numerical example. The designs are divided into a small number of distinct types which, the authors claim, simplifies the numerical computations as well as the interpretation of the results. A number of useful designs of each type are given for illustrative purposes.

2298 PEARCE, S. C.

Some new designs of latin square type.

J. R. Statist. Soc. (B) 1952 : 14 : 101-06.

The usefulness of the Latin square design is restricted by the fact that it must contain the same number of rows as columns. The author therefore considers designs which are Latin squares but with either (a) a column added, (b) a row and a column added, or (c) a column added and a row omitted. The analyses of these designs are given, their efficiency discussed and a numerical example in connexion with rabbit damage to young apple trees is given.

* General studies, see also individual crops.

- 2299 COX, D. R.
Some recent work on systematic experimental designs.
 J. R. Statist. Soc. (B) 1952 : 14 : 211-19.

Attention is confined to experiments in which the "plots" form a sequence and the effects, other than those due to the treatments, are representable by a simple trend or by a Markov autocorrelation function. An example is given for the first type from wool research.

- 2300 LORAIN, P. K.
On a useful set of orthogonal comparisons.
 J. R. Statist. Soc. (B) 1952 : 14 : 234-37.

Let a treatment occur in an experimental design at n equally spaced levels (1, 2, 3, ... n). It is shown how the sum of squares for treatments on $n-1$ degrees of freedom can be split into $n-1$ orthogonal sums each on one degree of freedom in order to determine the largest value k for which the treatment effect can be considered to be linear over the levels (1, 2, ... k).

- 2301 GRUNDY, P. M.
A general technique for the analysis of experiments with incorrectly treated plots.
 J. R. Statist. Soc. (B) 1951 : 13 : 272-83.

After a brief statement of the main results of regression theory and a short proof of these results at the end, this paper gives several examples of the analysis of the experimental situation given in the title. The analysis is based on an extension of the well-known missing-plot techniques.

- 2302 DYKE, G. V. & PATTERSON, H. D.
Analysis of factorial arrangements when the data are proportions.
 Biometrics 1952 : 8 : 1-12.

Consider an experiment arranged in a factorial design in which the observation for each treatment combination is a proportion, p . The authors propose that the transformation

$$z = \frac{1}{2} \log_e p/(1-p)$$

be used to analyse such an experiment. They suggest that with this transformation the effects might reasonably be additive and that therefore interactions would be more easily interpretable. The method of analysis by an iterative procedure is described in detail and an example given of the analysis of a 2^4 experiment.

- 2303 SHRIKHANDE, S. S.
On the dual of some balanced incomplete block designs.
 Biometrics 1952 : 8 : 66-72.

A method of construction of some partially balanced incomplete block designs with only two types of associates is given; also a table of designs.

- 2304 HARSHBARGER, B. & DAVIS, L. L.
Latinized rectangular lattices.
 Biometrics 1952 : 8 : 73-84.

The method of construction and analysis of this special type of near balance rectangular lattice is described and illustrated by an example.

- 2305 NAIR, K. R.
Analysis of partially balanced incomplete block designs illustrated on the simple square and rectangular lattices.
 Biometrics 1952 : 8 : 122-55.

A description is given of the analysis of partially balanced incomplete block designs with two, three or four associates, both interblock and intrablock. In particular, the case of four associates is worked out in detail, and illustrated on the simple rectangular lattice. The simple square lattice is used to illustrate the case of two associates.

- 2306 PURNENDU MOHON ROY
A note on the method of inversion of statistical designs.
 Sci. & Cult. 1953 : 18 : 440-41.

A series of theorems are presented on the types of design resulting from the inversion of various balanced incomplete block and partially balanced incomplete block designs. The examples are considered in respect of the concepts of resolvability and affine resolvability of the designs.

- 2307 HEINISCH, O.
 Die Vorteile der Anwendung von Summenverfahren bei der variationsstatistischen Auswertung von züchterischen Ergebnissen. (The advantages of using summation methods in the analysis of variance of breeding results).
 Z. Pflanzenz. 1953 : 32 : 7-26.

Examples are given of the calculation of the mean, standard deviation and correlation coefficient by summation methods.

2308 WHITE, C.

The use of ranks in a test of significance for comparing two treatments.
Biometrics 1952 : 8 : 33-41.

The problem considered by Kruskal and Wallis (cf. *PBA**, Abst. 2309) is examined for two groups, and tables provided whereby an exact significance test based on ranks can be performed provided the total number of observations does not exceed 30.

2309 KRUSKAL, W. H. & WALLIS, W. A.

Use of ranks in one-criterion variance analysis.

J. Amer. Statist. Ass. 1952 : 47 : 583-621.

Given C samples, with n_i observations in the i^{th} sample, a test of the hypothesis that the samples are from the same population may be made by ranking the observations from 1 to $N = \sum n_i$, finding the C sums of ranks, R_i , and computing the statistic

$$H = \frac{12}{N(N+1)} \sum_{i=1}^C \frac{R_i^2}{n_i} - 3(N+1).$$

If the samples come from identical continuous populations and the n_i are not too small, H is distributed as χ^2 on $C - 1$ degrees of freedom, and may be used to test the null hypothesis. This simple method is illustrated by examples. The question of ties is discussed. The distribution for small n_i is considered and tables for testing the significance in this case are provided. There is a discussion of the interpretation of the test and a detailed comparison of it with other tests.

2310 NELDER, J. A.

Statistical models in biometrical genetics.

Heredity 1953 : 7 : 111-19.

The assumptions underlying the portioning of continuous variation into its genetic and environmental components are discussed. The author then proceeds to reanalyse the data used by Mather (cf. *PBA*, Vol. XIX, p. 913) in his study of ear configuration in barley; the results of this reanalysis are in general agreement with those of Mather, though giving considerably higher values for the standard errors of $\hat{D}$ and $\hat{H}$.

2311 HAYMAN, B. I.

Components of variation under sib-mating.

Heredity 1953 : 7 : 121-25.

Coefficients of the D and H components of the

heritable portion of continuous variation (cf. *PBA*, Vol. XIX, p. 913) are calculated up to the S_{10} generation for populations derived from a cross between two true-breeding lines and perpetuated by continued sib-crossing.

2312 REEVE, E. C. R.

Studies in quantitative inheritance. III. Heritability and genetic correlation in progeny tests using different mating systems.

J. Genet. 1953 : 51 : 520-42.

"Assuming additive gene effects and no sex-linked inheritance, formulae are derived for estimating the heritabilities of two correlated quantitative characters, and the genetic correlation between them in a progeny test where the parents are mated assortatively, or selected, so as to increase the phenotypic variance of one of the characters. These mating systems alter the expected values of the regression of either character in the offspring on the mid-parent phenotype of the character which is not used as the basis for the mating system, and also alter the expected values of the components of variance and covariance in the analysis of the values for the two characters. Both mating systems have formally the same effect on the expected values of the various estimates. They also cause a substantial reduction in the standard errors of the regression coefficients, and thus enable more accurate estimates of heritability, etc., to be obtained from a given size of progeny test, at the risk of introducing an unknown amount of bias in the estimates if substantial non-additive effects are present. Examples are given of the application of these methods to progeny tests on wing and thorax length in *Drosophila melanogaster*.

"The problem is also examined of separating the contributions of sex-linked and autosomal genes to the heritability of a quantitative character. Estimates can be obtained if it is assumed that the genetic variance due to autosomal factors is the same in both sexes."

[Author's Summary].

†GENETICS

2313 TOLBERT, N. E. & PEARSON, P. B.

Atomic energy and the plant sciences.
Advanc. Agron. 1952 : 4 : 279-303.

A review is given of projects carried out in the

* Plant Breeding Abstracts.

† General studies, see also individual crops.

United States with the support of the Atomic Energy Commission to study the effects of radiation upon plants and to investigate various problems of plant sciences by means of radioactive isotopes. It includes an account of genetical investigations at national laboratories and cooperating universities. Most of these projects aim at discovering the fundamental mechanisms underlying the genetic changes induced. Others are devoted to agricultural genetics. In work on maize at the Brookhaven National Laboratory, an attempt is being made to induce, by continuous γ irradiation, mutations useful to the breeder. At the University of Minnesota, the effects of radioactive substances on plant pathogens and other microorganisms are being analysed. At the Ohio Experiment Station, an investigation is being made of the physiology and genetics of plant pathogens grown in the presence of radioisotopes. The effects of atomic bomb radiation on maize seed are the object of study at the California Institute of Technology. X ray treatment of groundnut at the North Carolina State College has resulted in mutants with an increased range of variability in resistance to leaf spot.

- 2314 DE MOL VAN OUD LOOSDRECHT, W. E.
 Dreissigjährige Erfahrungen in Bezug auf Mutation und Modifikation durch Röntgenbestrahlung. (**Thirty years' experience with mutations and modifications caused by X irradiation**).
 Angew. Bot. 1953 : 27 : 24-27.

Replying to American assertions, the author states that such chromosomal aberrations and somatic crossing over as may result from X irradiation of floricultural material do not invalidate this technique as a breeding method. Cytological analysis of his own X-irradiated material showed no trace of chromosome fragmentation. Hereditary changes caused by X irradiation are mainly genic.

- 2315 LEWIN, R. A.
The genetics of *Chlamydomonas Moewusii* Gerloff.
 J. Genet. 1953 : 51 : 543-60.

Ch. Moewusii is a haploid, heterothallic organism, with the advantage, from the point of view of biochemical genetical studies, of being chlorophyllous. Methods have been developed by means of which single zygotes can be mechanically isolated, and the products of meiosis cultured separately. Several biochemical and other mutants have been crossed; their characters behaved in a regular Mendelian manner.

Crossing-over apparently occurred in the four-strand stage. Up to six different characters have been combined in various single crosses. Evidence of linkage has been obtained in two cases, between two mutant loci, and between the locus of a third mutant and that for mating type.

- 2316 KIMURA, M.
(Theoretical considerations, based on reaction velocities, on multiple gene action).
 Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : 35-36. (Abst.). [Japanese].

An account in English of the theory developed in this paper has been summarized in Abst. 171.

- 2317 HARTSHORNE, J. N.
A suppressor in *Chlamydomonas Reinhardi*.
 Heredity 1953 : 7 : p. 152. (Abst.).

The progeny of an ultraviolet-induced "eyeless" mutant of *Ch. Reinhardi*, crossed with the wild type having an eyespot, showed segregation for eyespot and two monogenic characters affecting colony size and rate of growth. Both the latter were apparently suppressed by the wild type allele at the locus for eyespot, but were not immediately expressed when the mutation from eyespot to eyeless occurred; their origin is therefore obscure.

- 2318 KIMURA, M.
(On prediction of segregation ratios in Mendelian hybrids).
 Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : 118-20. [Japanese].

Given the linkage groups and recombination values of a set of genes, it is shown that prediction of segregation ratios is not always possible. However, prediction is possible if there are less than 4 genes in any linkage group and the frequency of triple and higher cross-overs between the given genes is negligible.

- 2319 RICHHARIA, R. H. & PRASAD, A.
Mendelian anomalies.
 Curr. Sci. 1953 : 22 : 105-07.

Anomalies in Mendelian segregation are classified into five categories: (1) ordinary deviation, in which segregation ratios both greater and smaller than the expected ones occur in the different families of a generation; (2) unidirectional deviations, the segregation ratios all being either greater or less than expected; (3) evolutionary deviations, in which the segregation ratio decreases or increases with successive generations; (4) aberrant segregations,

which cannot be assigned to any Mendelian type; and (5) inconsistent inheritance, in which the number of genes controlling a given character is not the same in all cases. The importance of giving due consideration to somatic segregation in elucidating Mendelian anomalies is stressed.

2320 PERKINS, D. D.

The detection of linkage in tetrad analysis.

Genetics 1953 : 38 : 187-97.

If unequal proportions of parental and recombinant ditype tetrads are produced by dihybrid zygotes it is assumed that segregation is non-random. Treatment of tetrad data from various organisms as though the component half-tetrads or single strands are independent is not, however, recommended for detecting linkage because the population size would thereby be increased and excessive significance attributed to all deviations. Linkage can be detected more efficiently by analysis of random single strands. It is nevertheless usual for tetrads to be used since additional information concerning chromatid inference and location of centromeres can be obtained from the same material.

2321 HARTE, C.

Untersuchungen über die Nachkommenschaft von Heterozygoten der *Graminifolia*-Koppelungsgruppe von *Antirrhinum majus*. (Investigations on the progeny of the *graminifolia* linkage group of *A. majus*).

Z. indukt. Abstamm.- u. VererbLehre 1953 : 84 : 480-507.

Temperature shocks from 20° to 10° C. during meiosis reduced the number of terminal chiasmata, and a number of genetical analyses showed also a statistically significant reduction in crossing-over percentage, as opposed to the control plants grown under constant temperature (10° C), in which there was a tendency for crossing over to increase from one flower to the next. This is ascribed to differences in nutrition from one flower to another and further data are given which show that pollen tube competition between the genotypes *cae* and *+cae* is influenced also by nutritional differences between flowers.

2322 BRIGGS, F. N. & ALLARD, R. W.

The current status of the backcross method of plant breeding.

Agron. J. 1953 : 45 : 131-38.

Success achieved at the California Agricultural Experiment Station in back-crossing programmes with numerous crops is cited in an attempt to overcome the reluctance of some breeders to adopt this method of breeding.

The steps taken to transfer stem rust resistance from the wheat Hope to bunt resistant Baart illustrate the technique used at the station. Other examples, concerning cereals, flax and Lima bean, show that back-crossing can effectively improve a variety, with respect to a number of either qualitative or quantitative characters, and that cross-pollinated crops will respond if enough seeds are developed to reproduce the gene frequencies characteristic of the recurrent parent.

2323 BUZZATI-TRAVERSO, A. A.

Identification of recessive gene heterozygotes by means of paper-partition chromatography.

Nature, Lond. 1953 : 171 : 575-76.

Paper-partition chromatography of tissues of different strains of *Drosophila* and certain plants with known genotype has revealed that each strain gives a constant and distinctive pattern. The chromatographic patterns of heterozygotes can be readily distinguished from those of either parental homozygous strain, even though the phenotype of the heterozygote is indistinguishable from that of the homozygous dominant, as in the case of the ultraviolet-fluorescent and ninhydrin-positive patterns of root-tip smears and leaf extracts of musk melons heterozygous for the mutation causing yellow-green coloration, and similar patterns of root-tip smears of heterozygotes for a male-sterile mutant in the tomato.

2324 SKINNER, J. C.

Genetical variation in excised root cultures of a spinach relative (*Senecio vulgaris* L.).

J. Hered. 1952 : 43 : 299-302.

Different strains of *S. vulgaris* were distinguished at Manchester University, England, by culturing excised roots in standard tomato medium, comprising White's medium with added copper and molybdenum, plus yeast extract and various other organic supplements. Inherent variations in vigour were very marked. It is possible that this technique may be applied to studies of hybrid vigour in different crops.

2325 WRIGHT, S.

Gene and organism.

Amer. Nat. 1953 : 87 : 5-18.

In the first part of his discussion of the concept of organism from the point of view of the geneticist, the author analyses the hierarchy of organisms, and is of the opinion that the gap between the nonliving molecule and living cell is now bridged to a considerable extent by such

entities as the transforming principles in bacteria, viruses and genes. In the second part, he propounds the concept that the essential nature of all reality is that of mind, each event involving an internal creative unity; science, dealing with external aspects, is thus regarded as a limited venture, only capable of a deterministic approach.

VARIATIONS, MODIFICATIONS, MUTATIONS

2326 GRANDJEAN, F.

Sur les variations individuelles. Vertitions (écarts) et anomalies. [**On individual variations. Vertitions (fluctuations) and anomalies**].

CR Acad. Sci. Paris 1952 : 235 : 640-43.

Three types of variation are distinguished. *Vertition*, for which the author formerly used the term *écart*, is a nonhereditary fluctuation, usually asymmetrical in bilaterally organized individuals, and often of evolutionary significance; the probability of a particular vertition appearing may be inherited. An *anomaly* is a rare fluctuation, usually asymmetrical like the vertition, but devoid of evolutionary significance. In contrast to the foregoing, a *mutation* is inherited and usually symmetrical. The relationship between these three categories is discussed.

2327 MARCHAND, H.

Analogie entre une loi d'union sélective et une loi de fécondité ou de survivance différentielles. (**Analogy between a law of selective union and a law of differential fertility or survival**).

CR Acad. Sci. Paris 1952 : 235 : 863-64.

Expressions are derived for the frequency of offspring in the population model previously studied by the author (cf. Abst. 17), for cases where differential parental fertility or differential survival of the offspring occur. These results are brought into line with the rather different approach to population genetics pursued by Wright (cf. *PBA*, Vol. V, Abst. 844).

2328 OWEN, A. R. G.

A genetical system admitting of two distinct stable equilibria under natural selection.

Heredity 1953 : 7 : 97-102.

It is shown that, if the genotypes *AA*, *Aa* and *aa* have different viabilities in the two sexes of dieocious organisms, then, under conditions of random mating, a multiplicity of stable equilibrium states is possible.

2329 OWEN, A. R. G.

Equilibrium of populations and the possibility of sustained large-scale oscillations.

Heredity 1953 : 7 : p. 151. (Abst.).

The construction of two theoretical populations is reported. One has two stable equilibria, and the initial conditions determine which one is attained. The other has no stable equilibria, but progresses through many states, performing perpetual oscillations of large amplitude; since it can be limited only by random extinction of a gene, its final state is indeterminate. The equilibrium of three alleles is also discussed and new relations between viabilities of the heterozygotes and homozygotes are derived.

2330 GRANHALL, I., EHRENBERG, L. & BORENIUS, S.

Experiments with chronic gamma irradiation on growing plants.

Bot. Notiser 1953 : No. 2 : 155-62.

Preliminary experiments are reported on the mutagenic effectivity of radiation of 2.6 rhm. produced under field conditions by Co⁶⁰. Mutants were induced in barley, *Vicia Faba*, apples and hops but not in the grasses and weeds in the neighbourhood.

2331 KAPLAN, R. W.

Über Möglichkeiten der Mutationsauslösung in der Pflanzenzüchtung. (**On the possibilities of inducing mutations in plant breeding**).

Z. Pflanzenz. 1953 : 32 : 121-31.

Data are given on experiments in inducing genetic changes with decreased adverse effect upon chromosome structure, by changes in treatment both during and after irradiation or with chemicals. Barley and soya beans were chosen as the most suitable material for the experiments, as the leaf aberrations of the *F*₁ generation enabled the adverse effects of chromosome damage to be easily ascertained.

Fewer chromosome mutations in relation to gene mutations were produced by excluding oxygen during irradiation. After irradiation, soaking the seeds in water, at temperatures of between 20° and 30° C., reduced sterility caused by damage to the chromosome structure, and the addition of certain ions, notably Na⁺, Br⁻ and I⁻, was also advantageous.

Irradiation in smaller doses, with intervals of at least two days, had no effect on the number of genetic mutations, whilst the number of chromosome mutations diminished. The longer the interval, the less damage was caused to the chromosome structure. In the case of soya

beans an interval of four days resulted in only 76 per cent. as much sterility as when the irradiation was continuous.

A method of producing dominant somatic chromosome mutations, either by X irradiation or chemicals, in plants capable of being propagated vegetatively, is also discussed. The mutant can be encouraged by the selective cutting away of normal growth and by planting selected cuttings. Details are given of successful experiments with *Ribes nigrum*.

2332 TOPČIEV, A. V.

(Progress report of the scientific research programme of the USSR Academy of Sciences for the year 1951).

Vestnik Akad. Nauk SSSR (Rec. Acad. Sci. USSR) 1952 : No. 2 : 17-40. [Russian].

In biology, a new theory of the interconversion of species has been developed and Mičurinite research on directing changes in plants continued. Šmaljgauzen, Dubinin and other Soviet geneticists, who were criticized for their idealist errors at the 1948 session of the Lenin Academy of Agricultural Sciences (cf. *PBA*, Vol. XVIII, Abst. 2000), are invited to report on their research, in the light of Mičurinite principles.

2333 CAIN, A. J.

Geography, ecology and coexistence in relation to the biological definition of the species.

Evolution, Lancaster 1953 : 7 : 76-83.

The terms geographical and ecological, as applied to the distribution of species, are shown to be ill-defined and overlapping. A revision of Mayr's biological definition of the species is proposed, avoiding these two terms. This definition and its derivatives are compared with some specific and subspecific concepts in botanical terminology. The author expresses the view that the use of distinguishing prefixes to indicate the different meanings of "species" is important.

*CYTOLOGY

2334 SINJUHIN, A. M.

(The question of ontogenesis of plant cells).

Agrobiologija (Agrobiology) 1952 : No. 6 : 80-91. [Russian].

Development of new cells in the callus tissues at the base of excised peduncles of a flowering

stalk of *Physalis* was investigated in the light of Lepešinskaja's theories (cf. *PBA*, Vol. XXI, Abst. 1509). The development of new cells began with the accumulation of a noncellular living substance on the surface of the traumatic tissues. This substance then divided into protocells of uneven sizes. The protocells became more highly organized and developed granules and one or more vesicles at points where the granules fused. The protocells and vesicles then divided into equal portions and between these a cell wall was formed. At the next stage more granules were produced and the number of vesicles increased. The granules then invaded the homogeneous vesicles and formed what are described as granular nuclei, which resembled mesocaryons. These nuclei divided into granules of varying size, which had the appearance of chromosomes. At this stage some cells had normal nuclei dividing by mitosis.

2335 VJAZOV, O. E.

(The cell theory at a new stage of its development).

Priroda (Nature) 1952 : No. 8 : 77-80. [Russian].

Soviet research on the development of cells from simply organized forms of protein was discussed at a recent conference held in Moscow. The principal address was delivered by Lepešinskaja, who expounded her theories on the origin of cells from noncellular living substance (cf. *PBA*, Vol. XXI, Abst. 1509). The joint report by Ellengorn, Gluščenko and Afanasjeva has been referred to in *PBA*, Vol. XXII, Abst. 1618.

2336 LEPEŠINSKAJA, O. B.

(A new cell theory).

Priroda (Nature) 1952 : No. 11 : 18-26. [Russian].

Recent experiments, in which animal cells are believed to have developed from noncellular proteins, are briefly mentioned and the probable influence of the author's new theory of the cell (cf. *PBA*, Vol. XXI, Abst. 1509) upon biological research is discussed.

2337 HUDJAK, M. I.

(New data on the development of cells in endosperms of spring wheat).

Dokl. Akad. Nauk SSSR (Rep. USSR Acad. Sci.) 1952 : 84 : No. 1 : 143-45. [Russian].

Cytological analyses of embryo sacs of the

* General studies, see also individual crops.

wheat *Lutescens* 062, selfed or pollinated with self pollen + pollen of two other unspecified spring wheats, showed that some cells developed from the cytoplasm. They were globular and were found in the central portion of the embryo sac. It is thought that the development of globular cells, which involves complex biological processes, begins immediately after fertilization. The processes of development of globular cells in the embryo sacs of spring wheat resemble those described by Lepešinskaja in animal material (cf. *PBA*, Vol. XX, Abst. 1509).

2338 SOSA-BOURDOUIL, C.

Remarques sur la répartition des acides nucléiques à désoxy-pentose dans quelques organes reproducteurs des végétaux. (**Notes on the distribution of desoxypentose nucleic acids in some plant reproductive organs**).

CR Acad. Sci. Paris 1952 : 234 : 2558-60.

In a survey of a wide series of plants for the presence of desoxypentose nucleic acid in the reproductive cells, using the Dische reaction, no traces of this substance could be detected in the mature pollen of various angiosperms nor in the spores of *Selaginella spinulosa* and *S. caulescens*.

2339 DURAND, C.

Données qualitatives sur la colorabilité et la sensibilité *in vitro* aux attaques enzymatiques de l'acide désoxyribonucléique. (**Qualitative data on the capacity for staining and susceptibility *in vitro* to enzyme action of desoxyribose nucleic acid**).

CR Acad. Sci. Paris 1952 : 234 : 1579-81.

In vitro studies are reported which indicate that depolymerized desoxyribose nucleic acid (DNA) is stained by pyronin and is decomposed by ribonuclease. Further, Feulgen's reaction is only given by depolymerized DNA, while DNA in a highly polymerized state is stained by methyl green, and unaffected by Schiff's reagent or ribonuclease. These observations reinforce the doubts voiced by Stedman and Stedman as to the localization of the two nucleic acids in the cell (cf. *PBA*, Vol. XIV, Abst. 17).

2340 YASUI, K.

(**The structure, development and genetics of reserve starch grains**).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : 34-35. (Abst.). [Japanese].

In this short review of the biological role of starch grains, allusion is made to the relationship between starch grains and plasmagones,

and to the genetics of starchiness in peas and maize.

2341 CHAYEN, J. & NORRIS, K. P.

Cytoplasmic localization of nucleic acids in plant cells.

Nature, Lond. 1953 : 171 : 472-73.

Using various techniques to study the distribution of nucleic acids in root meristem cells of *Vicia Faba* and other plants, preservation of cytoplasmic granules was found to be correlated with paucity of nuclear absorption at 2650 Å and of nuclear basophilia. Evidence of a change from cytoplasmic localization of desoxyribose nucleic acid, when the granules are destroyed, to nuclear localization has been obtained from cells studied *in vitro* and *in vivo*. Desoxyribose nucleic acid is therefore not necessarily confined to the nucleus in actively synthesizing cells, and the widely assumed desoxyribonucleoprotein composition for the gene may not be entirely valid. The Feulgen reaction is unsuitable for demonstrating the cytoplasmic localization of desoxyribose nucleic acid since the granules are destroyed by acid hydrolysis.

2342 ROZSA, G. & WYCKOFF, R. W. G.

The electron microscopy of onion root tip cells.

Exp. Cell Res. 1951 : 2 : 630-41.

Differences in the appearance of cellular protoplasm after acid and neutral fixation emphasize the need for determination of the effects of various chemicals before the protoplasmic and chromosomal texture of living cells can be adequately interpreted from electron micrographs. A series of micrographs of resting and dividing nuclei show that chromosomes have a fibrillar structure at prophase and telophase only; at other phases the chromatin appears to have a homogeneous structure. Pairing was well defined, but no evidence was obtained of chromonema, matrix, pellicle, centromeres or morphological entities recognizable as genes.

2343 STERN, F. C.

Cytology and horticulture.

J. R. Hort. Soc. 1952 : 77 : 394-405; 433-43.

Following a brief review of the cytological basis of Mendelism, the history of numerous plants is traced to emphasize the importance of making analyses of basic chromosome numbers and of generic relationships of chromosome complements prior to breeding by selection, hybridization and induction of polyploidy.

2344 FRASER, R. D. B. & CHAYEN, J.
The detection of nucleic acid in tissues by infra-red microspectrometry.

Exp. Cell Res. 1952 : 3 : 492-93.

Infrared spectra have been obtained from small areas of sections of bean root tips, using a reflecting microscope in conjunction with an infrared spectrometer. Absorption bands characteristic of ribonucleic and deoxyribonucleic acids were observed and it was possible to estimate the respective concentrations of both. Separate estimations of mononucleotides and polymerized and protein-bound nucleic acids may also be carried out by this technique, as the infrared spectra are distinct.

2345 **The chemistry and physiology of the nucleus.**

Exp. Cell Res. Suppl. 2 : 1952 : Pp. 402.

The following papers were among those read at the symposium held in August, 1951, by the Biology Department, Brookhaven National Laboratory, USA.

Stern, K. G. *Problems in nuclear chemistry and biology.* (pp. 1-15).

A general survey is given of evidence for close relationship between nucleic acids and genic material, and of theories of gene structure, with reference to genotype differentiation on the basis of sequence and spatial orientation of nucleotides and degree of polymerization.

Schultz, J. *Interrelations between nucleus and cytoplasm: problems at the biological level.* (pp. 17-43).

Work on nuclear structure, reproduction of genes and genetic units of the cytoplasm, and differentiation of nuclei in various tissues of the same individual is reviewed. The specific function of heterochromatic regions is discussed, with respect to research on mutation in *Drosophila* and maize.

Pollister, A. W. *Nucleoproteins of the nucleus.* (pp. 59-74).

An historical survey of the elucidation of nuclear composition by chemical analyses and ultraviolet absorption studies is presented. Protein changes during mitosis are discussed. It is pointed out that cytological evidence can be obtained to support either of the following concepts: that nonheterochromatic regions of interphasic chromosomes are swollen masses almost filling the nucleus; or that the chromosomes are uniformly slender, occupying but a small part of the nuclear volume and floating in nuclear sap.

Wyatt, G. R. *Specificity in the composition of nucleic acids.* (pp. 201-17).

The concept of the specific nature of desoxyribonucleic acid in individual genes is examined. Analyses of purines and pyrimidines show greater constancy of composition in higher organisms than in viruses, where a single mutation among the relatively few genes is often reflected by a detectable change in the total nucleic acid composition.

Sparrow, A. H., Moses, M. J. & Dubow, R. J. *Relationships between ionizing radiation, chromosome breakage and certain other nuclear disturbances.* (pp. 245-67).

Microsporocytes of *Tradescantia paludosa* contained about ten times as many chromosomal fragments as somatic cells after irradiation with γ rays. In *Trillium erectum* the amount of fragmentation induced by X rays was found to depend on the meiotic phase during which radiation took place. The sensitivity of chromosomes to breakage was not directly related to the desoxypentose nucleic acid (DNA) content of the nucleus but was correlated with the degree of chromonemal contraction; maximum fragmentation occurred at diplotene, the phase of greatest contraction. Inhibition of mitosis also occurred frequently following irradiation at diplotene; it is suggested that physiological disturbances, culminating in mitotic inhibition, may result from chromosome breakage. Although irradiation at meiotic prophase inhibited formation of major spirals and elongation of chromonemata between diplotene and anaphase I, no changes in DNA content or state of polymerization were detectable by Feulgen or methyl-green staining, respectively. The possibility that damage to DNA may be involved in the mechanism of breakage is not, however, excluded, since it is unlikely that conditions assumed to alter the protein component of the chromosome (cf. *PBA*, Vol. XVIII, Abst. 2055) would not also affect the DNA molecules.

Pelc, S. R. & Howard, A. *Chromosome metabolism as shown by autoradiographs.* (pp. 269-78).

Research on the synthesis of desoxyribonucleic acid (DNA), based on P^{32} uptake (cf. Abst. 2268), has been extended to include observations on the distribution of sulphur-containing proteins in roots of *Vicia Faba*, using S^{35} . Chromosomes continued to synthesize proteins containing sulphur after irradiation by X ray doses which inhibit DNA synthesis; thus a state of unbalance of nucleoproteins was

created, to which the effects of sublethal doses of X rays may probably be attributed. The mechanism by which X rays inhibit DNA synthesis is discussed, with respect to the hypothesis that chromosomes consist of chains of biosynthesizing units, each comprising an enzyme plus its substrate; since the sequence of units controls the step-wise synthesis of complex molecules, an ionizing radiation passing through a substrate in the chain releases electrons capable of inactivating the associated enzyme, either permanently or temporarily. The specificity of the effect of X rays indicates that only certain substrates can transfer electrons to an enzyme. Autoradiography is being used in an attempt to determine the sequence of compounds along a chromosome.

Bieseke, J. J., Berger, R. E., Clarke, M. & Weiss, L. *Effects of purines and other chemotherapeutic agents on nuclear structure and function.* (pp. 279-303).

Induction of chromosomal aberrations by chemical agents was studied in animal tissues and onion root tips. Using the latter, aberrations were induced not merely by methyl-bis (2-chloroethyl)-amine and 2,4,6-tris (ethylenimino)-s-triazine, but also by the following agents, having only one reactive group per molecule: 2-ethylenimino-4, 6-dimethoxy-s-triazine and ethylenimine. These results are discussed with reference to purine metabolism and the possibility that purines, such as are liberated from nucleic acid by X irradiation, may be the effective agents in mitotic disturbances.

Inoué, S. *The effect of colchicine on the microscopic and submicroscopic structure of the mitotic spindle.* (pp. 305-18).

Observation of oocytes of *Chaetopterus pergamentaceus* suggests that colchicine disorients the micelles of spindle fibres by breaking down bonds between the micelles and inhibiting the action of the substance responsible for polymerization and extension of the micelles.

DeLamater, E. D., Hunter, M. E. & Mudd, S. *Current status of the bacterial nucleus.* (pp. 319-43).

Evidence is summarized which indicates that bacteria share the following with higher organisms: (1) nuclei with nuclear membranes and filamentous chromosomes; (2) true mitosis; (3) conjugation, by which diploid nuclei are formed, giving rise to generations of cells differing in growth habit from haploid indi-

viduals; and (4) cytoplasmic granules corresponding to mitochondria (cf. Abst. 5). A consideration of staining techniques suitable for optimum observations is also included.

Putnam, F. W. *The origin of bacteriophage nitrogen, carbon, and phosphorus.* (pp. 345-66).

Isotopic investigations of the precursors of N, C and P in bacteriophage infecting *Escherichia coli* have shown that acid-soluble compounds are not significant precursors of the nucleic acid of T₆ or T₇. By labelling T₆-infected cells with adenine and guanine containing C¹⁴, it was shown that bacterial purines are used intact for nucleic acid synthesis. Experiments which differentiate the transfer of N and P suggest that the desoxyribonucleic acid of the host is degraded to nucleotides prior to conversion. Whether there is a nonspecific utilization of host material rather than a specific obligate contribution is discussed.

Kozloff, L. M. *The fate of the infecting virus particle.* (pp. 367-82).

From an isotopic analysis of viral progenies of T₆r⁺ and T₇, labelled with N¹⁵, it was concluded that no fixed amount of nucleic acid or protein was transmitted from infecting viruses to their progenies. Irradiation by ultraviolet rays and X rays sufficient to inactivate genetic components of T₆ and T₇ before host infection had no apparent effect on the amount of N¹⁵ contributed to viral progenies within bacterial hosts, suggesting that transference of N is independent of genetic units. The appearance of P³² in both T₆ and T₇ progenies, following infection of bacteria with labelled T₆ and unlabelled T₇, indicates that fragments of nucleic acid are transferred in a nonspecific manner between unrelated phages; a similar process is therefore possible among related phages, without genetic interaction. Although it cannot be said that no genetic units are transmitted from a parent virus to its offspring, any genetic transference must be very limited, since the nonspecific contribution of N and P constitutes only 0.1% of the total nucleoprotein of the progeny. It seems probable that physical transference of parent virus material is not necessary for viral replication. As infecting particles disrupt during reproduction, it is assumed that the genetic component survives long enough to pass on the heritable characteristics of a specific individual. The possibility that viral replication depends on the alteration and displacement of processes determining the production of host genes is discussed.

Hotchkiss, R. D. *The biological nature of the bacterial transforming factors.* (pp. 383-90).

Literature concerning the transforming agents of bacteria is reviewed to show that these agents are entities, functionally, if not cytologically, equivalent to the nuclear determinants of higher organisms.

- 2346 OGUR, M., ERICKSON, R. O., ROSEN, G. U., SAX, K. B. & HOLDEN, C.
Nucleic acids in relation to cell division in *Lilium longiflorum*.
Exp. Cell Res. 1951 : 2 : 73-89.

Analyses of desoxypentosenucleic acid (DNA) and pentosenucleic acid (PNA) during microsporangogenesis showed that the content of both substances dropped sharply at meiosis, with the formation of tetrads, but then increased gradually until microspore mitosis, when a rapid increase was noted. Subsequent pollen-grain development involved a further gradual increase of DNA, but the PNA content, about twice that of DNA at mitosis, increased at a rate nine times that for DNA during pollen grain maturation.

- 2347 TAFT, E. B.
The specificity of the methyl green-pyronin stain for nucleic acids.
Exp. Cell Res. 1951 : 2 : 312-26.

Techniques are described by which desoxypentosenucleic acid in nuclear chromatin and pentosenucleic acid in the nucleoli and cytoplasmic granules can be differentiated by using methyl green and pyronin respectively.

- 2348 KURNICK, N. B.
The basis for the specificity of methyl green staining.
Exp. Cell Res. 1952 : 3 : 649-51.

Although Taft does not consider that polymerization of desoxyribosenucleic acid (DNA) is an important factor in methyl green staining (cf. Abst. 2347), the author has found that the affinity of DNA for methyl green is so precise a function of the state of polymerization of DNA that a quantitative method for determining desoxyribonuclease activity has been based on this relationship (cf. *PBA*, Vol. XX, Absts. 1369 and 1370).

- 2349 CHAYEN, J.
The methyl green-pyronin method.
Exp. Cell Res. 1952 : 3 : 652-55.

Kurnick's method of staining desoxyribosenucleic acid (DNA) with methyl green and pyronin (cf. *PBA*, Vol. XX, Abst. 1369 and Vol. XXIII,

Abst. 2348) results in a more permanent stain than other shorter treatments. It is possible that the standard method of exposing sections to both stains for a short time depends on competition between the two stains, pyronin having less affinity than methyl green for DNA. On the other hand, Kurnick's method may be selective for polymerized DNA.

- 2350 DE BRUYN, P. P. H., FARR, R. S., BANKS, H. & MORTHLAND, F. W.
In vivo and in vitro affinity of diaminoacridines for nucleoproteins.
Exp. Cell Res. 1953 : 4 : 174-80.

It was shown that diaminoacridines have affinity for intranuclear desoxyribose and ribosenucleoproteins only *in vivo*, whereas, like other basic dyes, they stain all nucleoproteins *in vitro*. A possible chemical basis for this differentiation *in vivo* is discussed.

- 2351 COUTINHO, L. DE A.
Possibilidades taxonómicas de citogenética. (**Taxonomic possibilities of cytogenetics**).
Genet. Iber. 1952 : 4 : 21-42.

Examples of the value of chromosome studies for taxonomic purposes are given from the family Ranunculaceae, and the genera *Triticum*, *Vicia*, *Galeopsis*, *Crepis*, *Tradescantia* and others. A number of amphidiploid species occurring in nature are enumerated.

- 2352 WILKINSON, J.
Virus-induced nucleolar abnormalities in tomato.
Nature, Lond. 1953 : 171 : 658-59.

Abnormalities involving postponement of the utilization of nucleolar material by the contracting chromosomes during mitosis have been observed in tomato and tobacco plants infected with the aspermy virus (cf. *PBA*, Vol. XXII, Abst. 2326 and Vol. XXIII, Abst. 2877). This observation provides further support for the view that competition occurs between the virus particles and chromonematal material for the nucleoprotein in the nucleolus.

- 2353 SATO, D.
(**Tendencies in caryotype evolution**).
Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : p. 19. (Abst.). [Japanese].

Evolutionary tendencies in plant caryotypes are discussed, together with parallel evolutionary tendencies in macroscopic characters. The main evolutionary progressions appear to be from small chromosome number to large, from

large chromosomes to small, from long chromosomes to short, and from symmetrical chromosomes to asymmetrical.

2354 TAYLOR, J. H.

Autoradiographic detection of incorporation of P^{32} into chromosomes during meiosis and mitosis.

Exp. Cell Res. 1953 : 4 : 164-73.

Using sporogenous cells of anthers of *Tradescantia paludosa* and *Lilium longiflorum*, P^{32} was shown to be incorporated into nuclei during a relatively short period of interphase only. Evidence that this period corresponds to the phase of desoxypentosenucleic acid (DNA) synthesis is presented. An analysis of the time of chromosome reproduction, as indicated by X ray breakage, has led to the conclusion that P^{32} incorporation occurs at the time of chromosome reproduction and that DNA comprises part of the permanent framework of the chromosome. Incorporation of P^{32} was also associated with periods of active synthesis of pentose-nucleic acid.

2355 FERNANDES, A.

Sobre a cariologia de algumas plantas da Serra do Gerês. (On the caryology of some plants from the Serra do Gerês).

Agron. Lusit. 1950 : 12 : 551-600.

The plants reported on include *Allium sphaerocephalum*, *A. Victorialis* and *A. suaveolens*, all with $2n = 16$, and *Holcus Gayanus* ($2n = 8$).

2356 CÂMARA, A.

Progressos no estudo do centrómero. (Progress in the study of the centromere).

Broteria, Lisboa 1951 : 20 : 5-34.

Recent work elucidating the role of the centromere in meiosis is reviewed, special attention being paid to Portuguese work on the diffuse centromere of *Luzula purpurea* (cf. *PBA*, Vol. XVIII, Abst. 86).

2357 GAGNIEU, A.

Une technique pour le dénombrement des chromosomes par traitement direct des bourgeons à feuilles de pommiers (sans inclusion). [A technique for counting chromosomes by direct treatment of the leaf buds of apple trees (without embedding)].

Rev. Cytol., Paris 1948 : 10 : 243-46.

The technique is as follows: (1) fix the buds in acetic alcohol; (2) macerate in a freshly prepared mixture of 1 part 96-100% alcohol : 1 part concentrated HCl : 1 part 4% ferrous alum;

(3) transfer for a minimum of 2 days to a mixture of 3 parts absolute alcohol : 1 part of acetocarmine with a trace of iron; (4) heat gently on a slide in Belling's carmine.

2358 REESE, G.

Ergänzende Mitteilungen über die Chromosomenzahlen mitteleuropäischer Gefäßpflanzen. II. (Supplementary notes on the chromosome numbers of vascular plants of Central Europe. II).

Ber. dtsch. bot. Ges. 1953 : 66 : 66-74.

An annotated list of chromosome numbers of 25 species is given, 18 of which are believed to be recorded for the first time (cf. *PBA*, Vol. XXII, Abst. 1611). The list includes *Avena planiculmis* ($2n = ca.126$) and *Trifolium alpinum* ($2n = 16$).

2359 INOUÉ, S.

Polarization optical studies of the mitotic spindle. I. The demonstration of spindle fibers in living cells.

Chromosoma, Wien 1953 : 5 : 487-500.

An improved polarization microscope has facilitated detailed observations of spindle structure and function in living cells of animals and plants, including pollen mother cells of *Lilium longiflorum*, *Polygonatum biflorum*, *Gasteria carinata* and *Iris* sp. Component fibrils of spindle fibres have been distinguished. Some birefringent fibres connecting the chromosomes with the poles are designated chromosomal fibres, as distinct from spindle fibres which connect both poles and remain uninterrupted by chromosomes. A close resemblance is noted between structures observed in living cells and the appearance of the spindle in certain fixed preparations.

2360 BAUCH, R.

Das Problem der Mitosegift- und Wachstoffscheiteln bei der Wurzel. (The problem of the club effect in the root due to substances toxic for mitosis or to growth hormone).

Ber. dtsch. bot. Ges. 1952 : 65 : Generalversammlungs-Heft : 4-6.

A physiological study of the cells of the meristem after treatment with colchicine and with growth hormone suggests that the mode of origin of the club effect resulting from each kind of treatment is different.

2361 SELMAN, G. G.

The effect of ultrasonics on mitosis.

Exp. Cell Res. 1952 : 3 : 656-74.

Although root tips of *Allium Cepa* and pollen

tubes of diploid *Tradescantia* are ideal material for the observation of chromosomal fragmentation, no chromosomal breakage was detected in tissue surviving treatment with supersonic waves of 2.5 watts/cm.² Bridges due to stickiness of the chromosomes were, however, noted at subsequent mitoses, and the order in which vegetative and generative nuclei proceeded down the pollen tube of *Tradescantia* was changed. A temporary liquefaction of chromatin is suggested as an explanation of the observed stickiness.

2362 TIMONEN, S.

The sensitivity of the cell to X-rays.

Exp. Cell Res. 1953 : 4 : 142-50.

In an attempt to discover which mitotic phases are most sensitive to ionizing radiation, root tip cells of *Allium Cepa* were treated with indole-3-acetic acid or colchicine in combination with X rays. Maximum breakage and bridge formation were seen in meristematic cells which had been arrested at interphase by indole-3-acetic acid before irradiation. Cells treated with colchicine also showed a high incidence of breakage, assumed to be due to a decrease in the rate of restitution and reunion caused by colchicine. Cells above the apex proved highly resistant to the ionizing effects of radiation, but mitosis was induced in differentiated cells by irradiation followed by immediate treatment with indole-3-acetic acid. The mechanism by which X rays induce structural changes of specific nature in different chromosomal segments is discussed.

2363 DUTT, M.

Dividing nuclei in coconut milk.

Nature, Lond. 1953 : 171 : 799-800.

The milk from coconuts and other nuts contains free nuclei, some of which may be dividing mitotically; it should therefore provide valuable material for studying the direct effects of antibiotics and other substances on chromosomes.

2364 D'AMATO, F.

The cytological study of chemical mutagens.

Genet. Iber. 1952 : 4 : 1-19.

This lecture, given at Madrid on 26 June 1952, reviews literature concerning the physiological and structural changes induced by chemical mutagens, with emphasis on parallelism between the mutagenic activity of chemicals and ionizing radiations. Special reference is made to the usefulness of the *Allium* test devised by the author (cf. *PBA*, Vol. XXI, Abst. 41).

2365 JACOBSON, W. & WEBB, M.

The two types of nucleoproteins during mitosis.

Exp. Cell Res. 1952 : 3 : 163-83.

The distribution of ribonucleoproteins and desoxyribonucleoproteins was demonstrated (cf. Abst. 865) using the May-Grunwald and Giemsa method by which ribonucleoproteins stained blue and desoxyribonucleoproteins stained purplish red. During anaphase, ribonucleoprotein appeared to be shed from the two separating groups of chromosomes into the cytoplasm between.

2366 CASTRO, D. & MELLO-SAMPAYO, T.

Observações sobre *Luzula purpurea* Link. (Observations on *L. purpurea* Link).

Broteria, Lisboa 1951 : 20 : 87-100.

A small section of terminal heterochromatin has been detected in one chromosome pair of *L. purpurea*. A case of asynapsis following colchicine treatment is also described (cf. *PBA*, Vol. XVIII, Abst. 86).

2367 CONGER, A. D.

The effect of boron enrichment on slow neutron-irradiated tissues.

Genetics 1953 : 38 : 128-33.

A unit dose of thermal neutrons from the nuclear reactor at Oak Ridge, Tenn., induced four to five times as many chromatid aberrations in microspores of *Tradescantia* grown in boric acid solution, containing 10 ppm. of the stable isotope B¹⁰, than in microspores of control plants. The increased number of aberrations were caused by the intracellular α radiation emitted when thermal neutrons reacted with B¹⁰, an isotope with a large nuclear cross-section for capturing neutrons (cf. *PBA*, Vol. XXI, Abst. 83).

2368 SPARROW, A. H. & SINGLETON, W. R.

The use of radiocobalt as a source of gamma rays and some effects of chronic irradiation on growing plants.

Amer. Nat. 1952 : 87 : 29-48.

Co⁶⁰ has been used as a source of continuous γ radiation of plants under field conditions at the Brookhaven National Laboratory, Upton, Long Island, NY. The installation and method of operation of sources of approximately 16 and 145 curies are described, and a survey is given of the cytological, genetic and morphological effects of chronic irradiation upon various species.

In *Tradescantia paludosa* a significant increase in the number of micronuclei resulting from

breakage occurred with a dose rate as low as 0.41 r. per day. The numbers of micronuclei did not increase significantly after 32 and 64 days of irradiation, in comparison with the frequency after 16 days' exposure. After 47 days' treatment at a rate of 23.4 r. per day, fragmentation during meiosis was ten times greater than that scored in somatic cells.

With exposure to chronic γ radiation, the percentage of abnormal pollen grains in maize increased with the dose rate, but no marked increase compared with the control occurred with a dose less than 2.6 r. per day; the maximum effect, 57% abnormal grains, was recorded with 266 r. per day.

Experiments on four endosperm characters of maize gave the following results: (1) when the radiation was less than 5 r. per day, no increase in mutation rate was detected; (2) the logarithm of the mutation rate was linearly proportional to dose rate; and (3) *R*, the gene with the greatest frequency of spontaneous mutation, showed a smaller percentage of induced changes than *Su*, *Sh* and *Pr* (cf. *PBA*, Vol. XXII, Abst. 1855).

2369 NISHIYAMA, I.

(Cytogenetics and its application to plant breeding).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : 9-15. [Japanese].

The principal topics reviewed in this lecture are the cytology of interspecific hybrids involving various grades of genomic affinity, autopolyploids and allopolyploids, and the effect of the cytoplasm. The examples are mainly drawn from work on wheat and oats.

2370 LINNERT, G.

Der Einfluss von Chemikalien auf Chiasmenbildung und Mutationsauslösung bei *Oenothera*. (The effect of chemical substances upon chiasmata formation and the induction of mutation in *Oenothera*).

Chromosoma, Wien 1953 : 5 : 428-53.

The following results were obtained when various species and hybrids of *Oenothera* (cf. *PBA*, Vol. XXII, Abst. 54) were treated with inorganic salts, acids, bases, urethane, saponin, sugar and also, for purposes of comparison, X rays.

Inorganic salts lowered the chiasma frequency, nitrogen compounds and aluminium salts having a particularly strong effect. The reaction was a threshold effect, not dependent on the concentration of the solution or the pH.

While the organic compounds exhibited no

particularly depressive influence on chiasma frequency, they had a more or less powerful mutagenic effect.

No correlation could be found between chiasma formation and the mutation process.

Temperature shock affected the number of chiasmata formed (cf. *PBA*, Vol. XXII, Abst. 2448).

2371 SCHOLES, M. A.

The effect of hexachlorocyclohexane on mitosis in roots of the onion (*Allium cepa*) and strawberry (*Fragaria vesca*).

J. Hort. Sci. 1953 : 28 : 49-68.

When onion seeds germinated in contact with hexachlorocyclohexane, the frequency of nuclear divisions was unaffected. Chromosomal lagging and stickiness were commonly observed at telophase, with subsequent exclusion of nuclear fragments. Higher concentrations of the insecticide delayed or inhibited spindle formation and gave rise to polyploid cells, which sometimes reduced the growth rate and led to seedling hypertrophy. *Fragaria vesca* runners rooted in soil treated with hexachlorohexane showed similar cytological abnormalities.

2372 COE, G. E.

Cytology of reproduction in *Cooperia pedunculata*.

Amer. J. Bot. 1953 : 40 : 335-43.

Data are presented concerning meiotic irregularities and apomixis in *C. pedunculata*. The author has used extracts from the bulb of this species to inhibit mitosis in onion root tips; the extract caused marked shortening of the chromosomes and large extranuclear bodies were formed.

2373 MOTA, M.

The action of seed extracts on chromosomes.

Arq. Pat. 1952 : 24 : 336-57.

Root tips of *Allium Cepa* were treated with aqueous extracts of barley seeds 1 or 7 years old and of rye seeds 4 years old. No qualitative differences were found between the cytological effects of the extracts from the fresh and old seeds. The following were the chief abnormalities produced: strong contraction of the chromosomes; lampbrush chromosomes; precocious multiplication and separation of the chromonemata; c-mitotic disturbances; c-pairs arranged in an equatorial plate; chromosome fragmentation; lagging daughter chromosomes; visibility of centromere bodies; chromatic agglutinations; and protuberances of the resting nuclei. It is

suggested that the lampbrush appearance may be due to an alteration in the metabolism of thymonucleic acid. The occurrence of c-pairs arranged in an equatorial plate is regarded as evidence that colchicine acts not only on the spindle but also on the centromere. Chromosome fragments were fairly constant in type, suggesting the existence of localized zones of fragmentation.

2374 WOLL, E.

Einwirkung von Nucleinsäuren und ihren Baustoffen auf die Wurzelspitzenmitose. (**The effect of nucleic acids and their structural components upon mitosis in root tips**).

Chromosoma, Wien 1953 : 5 : 391-427.

Experiments on the effect of desoxyribose and ribose nucleic acid, their components adenine, adenosine, thymine and their postulated precursors l-histadine, l-arginine, urea, malonic acid and lactic acid upon mitosis in root tips of *Vicia Faba* and *Impatiens balsamina* confirmed the view that disturbances in nucleic acid metabolism may induce chromosome aberrations.

All the substances tested had injurious effects on the frequency of division and the incidence of the various stages of meiosis, as well as causing morphological anomalies of both cell and chromosomes.

Specific effects noted were: (1) the enlargement of the nucleolus by the nucleic acids; and (2) delayed nucleolar disintegration in early metaphase, following treatment with ribose nucleic acid.

Adenine induced c-mitosis, but adenosine did not. The increase observed in the number of chromosome breakages was particularly high in the SAT chromosome, in which the centromere and the secondary constriction were especially prone to break.

2375 CARSON, H. L.

The effects of inversions on crossing over in *Drosophila robusta*.

Genetics 1953 : 38 : 168-86.

A detailed account of the influence of naturally occurring inversions on intrachromosomal suppression and interchromosomal intensification of crossing over in a series of structural heterozygotes indicates that the total frequency of genic exchange is not greatly reduced. Crossing over becomes restricted mainly to those chromosomal sections not involved in inversions. It is suggested that the species may thus have the advantages of adaptive chromosomal polymorphism and retain, at the same time, the

possibility of evolutionary adjustment through a high degree of recombination in structurally homozygous chromosome sections.

2376 GARDÉ, A.

A importância da fragmentação cromossômica na evolução. (**The importance of chromosome fragmentation in evolution**).

Broteria, Lisboa 1951 : 20 : 159-76.

The evolutionary significance of chromosome fragmentation is reviewed. It is believed to play an important role in genera such as *Luzula*, where the centromere is diffuse (cf. *PBA*, Vol. XXII, Abst. 2434).

2377 LINNERT, G.

Der Einfluss von Chemikalien auf die Chiasmenbildung von *Oenothera*. (**The effect of chemical substances upon the chiasma formation of *Oenothera***). Ber. dtsch. bot. Ges. 1952 : 65 : Generalversammlungs-Heft : 1-2.

The inorganic salts tested generally caused an increase in the number of open, terminal chiasmata, and the particularly powerful action of nitrates and of salts of ammonium and of aluminium suggests that the nitrogen and aluminium ions act directly upon the cytoplasm. Methane, alkaloids and mixtures of ethylurethane with KCl exert less or no effect on chiasma frequency, but all are mutagenic in some degree; and the two types of effect arise quite independently of each other.

Evidence was also found in favour of the chain reaction interpretation of the causation of induced chromosome mutations and of chiasma formation. Cf. also Abst. 2370.

2378 PRELL, H.

Untersuchungen über die Aufnahme von Anelektrolyten in Zellen di- und polyploider Pflanzen. (**Investigations on the uptake of anelectrolytes in cells of diploid and polyploid plants**).

Planta, Berlin 1953 : 41 : 480-508.

In *Antirrhinum majus* and *Rhoeo discolor* the osmotic value of tetraploid cells was less than that of the corresponding diploid and in *Oenothera franciscana* there was a general tendency for the values to decrease progressively from $2n$ to $3n$ to $4n$. The permeability of the cells to diosmotic substances such as malonamide, glycerine, glycol and acetamide was usually greater in the polyploid cells, but sometimes equal to that of the diploids. Ions of Li, K and Cs in low concentration increased permeability in both diploids and polyploids.

The increase was greater in polyploids than in diploids but the effect of the ions was less pronounced in those species in which permeability was most increased by polyploidization. The triploids were equal to the tetraploids in permeability to malonamide and glycerine, less for the other two substances.

The results lead to the conclusion that certain metaosmotic and nonosmotic processes as well as purely osmotic processes are responsible for the effects.

2379 ESSER, K.

Eine Eintauchmethode zur Colchicinbehandlung. (**An immersion method of colchicine treatment**).

Züchter 1953 : **23** : 148-50.

The seeds are sown in a pot, around a Petri dish, sunk in the earth, into which the shoots of the seedlings are allowed to grow; at the desired time the dish is filled with colchicine solution and the shoots are kept immersed by laying a glass plate upon them. Seeds of Gramineae are placed within the dish on a piece of pith at the edge; the roots are allowed to grow into the earth and when the first leaf is forming the coleoptile is cut with a razor and immersed in the colchicine solution.

Treatment with 0.1% colchicine solution for 24-36 hours was most effective for buckwheat and 0.05% for 24 hours for rye seedlings.

2380 MASCRÉ, M. & DEYSSON, G.

Action mitoclasique de la desméthylcolchicine, comparée à celles du colchicoside et de la colchicine. (**The mitoclastic action of desmethylcolchicine compared with those of colchicoside and colchicine**).

CR Acad. Sci. Paris 1952 : **234** : 2480-82.

Differences in the c-mitotic action of desmethylcolchicine, its glucoside colchicoside and colchicine are pointed out (cf. Abst. 2382). It is noted that the effectivity of desmethylcolchicine declines with time.

2381 KUMAR, L. S. S.

Doubling of chromosomes induced by gloriosine isolated from *Gloriosa superba*, Linn.

Nature, Lond. 1953 : **171** : 791-92.

At the College of Agriculture, Poona, plumules of *Crotalaria juncea* seedlings were immersed for 4 hours in 0.3% aqueous solutions of colchicine from *Colchicum autumnale* and *G. superba*, and the allied alkaloid gloriosine from the latter species. Recognition of polyploidy was based upon observations of swelling and retarded

growth of seedlings. According to this criterion, gloriosine and colchicine from *G. superba* were both polyploidizing agents, gloriosine showing promise of being more effective than colchicine from either source.

2382 MASCRÉ, M. & DEYSSON, G.

Action mitoclasique du colchicoside, comparée à celle de la colchicine. (**Mitoclastic action of colchicoside, compared with that of colchicine**).

CR Acad. Sci. Paris 1952 : **234** : 1901-03.

Colchicoside, a glucoside of desmethylcolchicine, has a similar mitoclastic and tumefactory action to that of colchicine, but only in considerably higher concentrations. Its effects were studied on root tips of *Allium Cepa*.

2383 IIZUKA, M.

(**The functional life of the female organ in artificial polyploid plants**).

Idengaku Zasshi/Jap. J. Genet. 1950 : **25** : p. 23. (Abst.). [Japanese].

The receptive period of the stigma was studied in colchicine-induced tetraploid strains of *Brassica pekinensis*, turnip and radish and compared with that in diploid material. Determinations were made of the changes observed during development of the following characters: (1) ratio of number of pods set to number of flowers pollinated; (2) ratio of number of seed set to number of flowers pollinated; (3) ratio of number of seed set to number of placental areas; and (4) the relation between seed set and distance of the placental areas from the stigmas. In general, the receptivity of the stigma was high 3-4 days after the opening of the flower, thereafter declining. Significant differences during the initial receptive period between the strains studied were not evident, but marked differences appeared in the rate of loss of receptivity. These differences, however, bore no simple relation to species or degree of polyploidy.

2384 MULTAMÄKI, K.

Några data om polyploidförädlingen. (**Some data on polyploid breeding**).

Tidskr. Lantm., Helsinki 1953 : **35** : 38-41.

The method of inducing polyploidy in crop plants is explained with examples from successful work on rye, *Triticale*, clover, sugar beet and turnips. The new, tetraploid turnip Sirius, bred at Svalöf, surpassed the other varieties tested there both in yield of roots and dry matter, but its dry matter content was lower as compared with diploid turnips.

2385 WILLIAMS, R. C.

A method of freeze drying for electron microscopy.

Exp. Cell Res. 1953 : 4 : 188-201.

Details are given of a method developed at the Virus Laboratory, Berkeley, Calif., for very rapid freezing and fairly rapid vacuum sublimation of specimens. Electron micrographs show that the technique preserves three-dimensional structure, while surface tension is negligible during sublimation.

2386 GEROLA, F. M.

Gli acidi nucleinici nella gametogenesi vegetale. (Nucleic acids in gametogenesis in plants).

Comment. Pontif. Acad. Sci. 1949 : 13 : 1-76, also Lav. Bot. Ist. Bot. Univ. Padova 1952 : 15.

Studies were made on the localization of ribonucleic acid in the developing male and female gametophytes of *Senecio vulgaris*, *Sambucus nigra* and *Pyrethrum cinerariaefolium*. It reaches a maximum in the tapetal cells at the time of the liberation of the pollen cells. In the female gametophyte it reaches a maximum in the cells of the integument at the time of vacuolization. The possible functions of ribonucleic acid are discussed.

2387 HEINRICH, H. C., HILL, H. & BRILLING, S. Eine zur mikrobiologischen Bestimmung der B₁₂-Vitamine geeignete weisse Mutante der Grünalge "*Euglena gracilis* var. *bacillaris*." (A white mutant of the green alga *Euglena gracilis* var. *bacillaris* suitable for determining vitamin B₁₂).

Naturwissenschaften 1953 : 40 : 144-45.

A white mutant obtained by treatment with streptomycin proved incapable of dividing without addition of vitamin B₁₂ and could be used for estimating this compound, the incubation time being reduced in this way from 7 to 3-4 days and the necessity for a photothermostat obviated.

AGRICULTURE

2388 MEYER, K.

Zur Frage der Leistung und des Ausbaues unseres Sortenversuchswesens. (On the question of the performance and expansion of our system of variety trials).

Z. Acker- u. PflBau 1950 : 92 : 416-30; 1953 : 96 : 187-94.

The present variety trials in Germany are

criticized on the grounds that they give only the average value of a variety and are often inaccurate. To avoid varieties of value to a particular district being overlooked, the institution of a large number of small, closely coordinated trials is recommended. The results of these would be combined at a higher level, and thus both the local suitability of a variety and its general value could be ascertained.

2389 GRIESBECK, A.

Aktuelles in Kürze. (Current news). Saatgutwirtschaft, Stuttgart 1953 : 5 : 141-42.

New regulations for seed certification in Western Germany come into force on 1 November 1953. All previously certified varieties will be re-examined, and a special classification given to those varieties which, although not fulfilling the requirements of the new regulations, are still considered valuable from an agricultural standpoint. The object of the new regulations is to promote the breeding of better varieties.

*DISEASES, INJURIES, BACTERIA, FUNGI, VIRUSES

2390 RUBIN, B. A.

The mechanism of genetic effect of P³² in bacteria.

Brookhaven National Lab. [undated] (BNL-1069) : Pp. 13.

[from Nuclear Sci. Abstr. 1952 : 6 : Abst. 1086].

Analyses of the metabolic characteristics of bacterial cultures show that the genetic effects of P³² may be attributable to the rupture of the phosphate bond in desoxyribosenucleic acid. Possible evolutionary significances are discussed.

2391 EPHRUSSI, B., LEOPOLD, U., WATSON, J. D. & WEIGLE, J. J.

Terminology in bacterial genetics.

Nature, Lond. 1953 : 171 : p. 701.

As an example of the general confusion in the vocabulary for bacterial genetics, the view is expressed that the words transformation, induction and transduction have been used to describe aspects of a single phenomenon, viz. sexual recombination. They suggest "inter-bacterial information" as a substitute for the above three terms, since it does not necessarily imply the transfer of material substances and recognizes the possible future importance of cybernetics at the bacterial level.

* General studies, see also individual crops.

2392 ARMITAGE, P.

The statistical theory of bacterial populations subject to mutation.

J. R. Statist. Soc. (B) 1952 : 14 : 1-40.

This paper is a mathematical study of the growth of a mixed bacterial population composed of two types of organisms, and subject to mutation from one type to the other, in one or both directions with, or without, phenotypic delay. The bacteria divide by binary fission, but the rates of division for the two types may differ. The paper provides a unified and critical presentation of statistical results previously published by other authors. In addition several new results for various models of bacterial growth and mutation are obtained. The problem of estimation of the parameters of a mutation process is discussed and recommendations made. The last part of the paper contains an investigation into the adequacy of some of the proposed models in relation to the experimental results. In the discussion that followed, Bartlett suggests another model for which he gives the solution of the equations.

2393 ADELBERG, E. A. & MYERS, J. W.

Modification of the penicillin technique for the selection of auxotrophic bacteria.

J. Bact. 1953 : 65 : 348-53.

One of the principal modifications comprises the use of solid medium, so that each mutation gives rise to a readily identifiable colony. By keeping cells in a minimal medium prior to the final enrichment with growth factors, and by applying penicillin to microcolonies instead of to single cells, the yield of auxotrophs reaches a consistently high level. Using strains of *Escherichia coli*, over 90% of the colonies isolated represented stable mutants.

2394 LEIFSON, E. & HUGH, R.

Variation in shape and arrangement of bacterial flagella.

J. Bact. 1953 : 65 : 263-71.

Spontaneous flagellar variation has been observed in strains of *Aeromonas*, *Xanthomonas* and an organism, H-247, classified physiologically as *Alcaligenes*. The possibility that taxonomic confusion may be caused by these variations, particularly if similar variability occurs in other species, is discussed. It is suggested that all flagella may have a polar origin, in which case, peritrichous types must be multicellular. The variation within H-247 from polar to peritrichous, the latter being stable, may represent an evolutionary tendency,

which can be translated into an evolution from unicellular to multicellular organisms.

2395 LABRUM, E. L. & BUNTING, M. I.

Spontaneous and induced color-variation of the HY strain of *Serratia marcescens*.

J. Bact. 1953 : 65 : 394-404.

The rate of occurrence of stable pink and white colonial variants, which appeared spontaneously in red cultures of HY, increased significantly following ultraviolet irradiation. Chemical agencies, however, had no apparent influence on the mutation rate. Both mutations and lethal effects of ultraviolet rays were reversed by photoreactivation.

An unstable colourless variant, giving speckled colonies on synthetic media, arose spontaneously in all cultures. Ultraviolet irradiation had no effect on the production of these unstable variants, but cultural conditions influenced their numbers.

2396 CATLIN, B. W.

Response of *Escherichia coli* to ferrous ions. I. Influence of temperature on the mutagenic action of Fe⁺⁺ for a streptomycin-dependent strain.

J. Bact. 1953 : 65 : 413-21.

Treatment of the streptomycin dependent strain Sd-4 at 1° C with Fe⁺⁺ in concentrations of 2 to 5 × 10⁻⁵ M results in greater lethal effect, higher frequency of reversion to streptomycin nondependence, and greater inhibition of subsequent S³⁵ incorporation than comparable treatment at 37° C. These results are consistent with the supposition that adsorption of Fe⁺⁺ is stimulated by low temperatures. However, a temperature shock produced by a sudden change from 1 to 37° C. during Fe⁺⁺ treatment gives rise to a large increase in the number of reverse mutants, indicating the influence of factors other than those affecting adsorption of Fe⁺⁺.

2397 CATLIN, B. W.

Response of *Escherichia coli* to ferrous ions. II. Influence of nitrogen and oxygen on the mutagenic and lethal effects of Fe⁺⁺ for a streptomycin-dependent strain.

J. Bact. 1953 : 65 : 422-27.

Whether *E. coli* Sd-4 is exposed to Fe⁺⁺ in the presence of nitrogen or oxygen, treatment at 1° C. produces a greater lethal effect and a higher rate of reversion from streptomycin dependence to nondependence than treatment at 37° C. The effect of a temperature shock

(cf. Abst. 2396) was increased by exposure to oxygen; reverse mutations were less frequent in nitrogen.

2398 KVASNIKOV, E. I.

(The alcohol tolerance of sour milk bacteria).

Mikrobiologija (Microbiology) 1952 : 21 : 160-65. [Russian].

Many strains of various sour milk bacteria, mostly *Lactobacterium* spp., were selected and tested for their tolerance of alcohol. Most strains developed in 16-18% alcohol, but some were tolerant of 20-22% and a few of 23%. Coexistence of sour milk bacteria with *Saccharomyces ellipsoideus* and *S. cerevisiae* and mutual help between the genera is referred to.

2399 ROBINOW, C. F.

Observations on the nucleus of resting and germinating spores of *Bacillus megaterium*.

J. Bact. 1953 : 65 : 378-82.

Using methods of fixation, hydrolysis and staining employed by DeLamater and Hunter (cf. *PBA*, Vol. XXII, Abst. 2481), the author has demonstrated eccentric nuclei in resting spores of *B. megaterium*. He considers that eccentric nuclei were not observed by DeLamater because their material had already undergone the initial changes of germination, with which central nuclei are associated.

2400 KELNER, A.

Growth, respiration, and nucleic acid synthesis in photoreactivated *Escherichia coli*.

J. Bact. 1953 : 65 : 252-62.

Ultraviolet radiation capable of inactivating 90% of the cells of *E. coli* B/r stopped cellular division, but had little effect on cellular enlargement or O₂ absorption in succinate or nutrient broth. Larger doses of ultraviolet rays inhibited cell growth, but this effect could be reversed by postirradiation photoreactivation. The immediate and specific inhibition of deoxyribose nucleic acid synthesis by low doses of ultraviolet rays is considered to be the basic cellular change causing the familiar responses to ultraviolet radiation; synthesis was resumed at an accelerated rate after treatment with reactivating light.

2401 DELAMATER, E. D. & MUDD, S.

The occurrence of mitosis in the vegetative phase of *Bacillus megaterium*.

Exp. Cell Res. 1951 : 2 : 499-512.

Photomicrographs demonstrating a sequence of

events corresponding to mitotic phases in larger organisms are presented (cf. *PBA*, Vol. XXII, Abst. 940). Distorted nuclear configurations were attributed to the random position of the axis of the dividing nucleus in relation to the axis of the multinucleate cell and to aggregation of chromosomal units.

2402 BISSET, K. A.

The interpretation of appearances in the cytological staining of bacteria.

Exp. Cell Res. 1952 : 3 : 681-88.

Many of the data concerning demonstrations of mitotic spindles, mitochondria and other cytological phenomena associated with cells of higher plants have already been summarized in *PBA*, Abst. 1706.

2403 BISSET, K. A., JOYCE, G. & MORRIS, E. O.

The nuclear reduction process in bacteria.

Exp. Cell Res. 1951 : 2 : 388-92.

In the final stages of microcyst maturation in *Bacterium aerogenes*, various Myxobacterales and *Actinomyces bovis*, nuclear division unaccompanied by cell division was observed. One of the two daughter nuclei became the resting nucleus, while the other disintegrated. From a study of life cycles it is concluded that this division represents nuclear reduction from the diploid to the haploid state.

2404 CAMIEN, M. N. & DUNN, M. S.

A d-lactic acid-requiring mutant of *Lactobacillus casei*.

J. Biol. Chem. 1953 : 201 : 621-28.

The mutant *L. casei* 280-16 induced by ultraviolet irradiation, requires d-lactic acid as an essential metabolite. It has remained stable in serial subcultures for six months.

2405 SHAPIRO, S. K.

Response of *Aerobacter aerogenes* methionine auxotrophs to adenine thiomethyl compounds.

J. Bact. 1953 : 65 : 310-12.

The successful isolation of three types of methionine requiring auxotrophs from ultraviolet-irradiated cultures of *A. aerogenes* NRRL 199 by the replica plating method is reported (cf. *PBA*, Vol. XXII, Abst. 2498). One group can utilize adenine or methionine, and a second group responds to homocysteine, thiomethyl adenosine or methionyl adenosine. One of the isolates, however, can utilize only methionine. The genetical blocks inhibiting methionine biosynthesis are being determined for each type of auxotroph.

2406 BARKULIS, I. L.

Inhibition of the anaerobic pyruvate metabolism of *Escherichia coli* by dihydrostreptomycin.

J. Bact. 1953 : 65 : 337-43.

The capacity of *E. coli* N to ferment pyruvate is inhibited by dihydrostreptomycin, but two mutants isolated in the presence of this antibiotic continued to ferment pyruvate, their sole source of carbon for anaerobic growth; one mutant was dependent on dihydrostreptomycin (D), the other was resistant (R). The rate of pyruvate fermentation shown by both mutants was, however, much lower than in the parent strain.

2407 KAPLAN, S., ROSENBLUM, E. D. & BRYSON, V.

Adaptive enzyme formation in radiation-sensitive and radiation-resistant *Escherichia coli* following exposure to ultraviolet.

J. Cell. Comp. Physiol. 1953 : 41 : 153-62.

Cultures of the sensitive strain B, in which 99% of the cells were inactivated by ultraviolet radiation (1080 ergs/mm.²), showed the same O₂ uptake as the radiation-resistant mutant *E. coli* B/r on substrates requiring adaptive enzyme formation. In both strains O₂ uptake was progressively reduced by increased doses of ultraviolet rays. It is therefore concluded that ultraviolet-sensitivity differences between B and B/r in respect of cell division are not extended to include synthesis of adaptive enzymes.

2408 YANOFSKY, C.

Effects of X-rays on the formation of lactase in a lysogenic strain and a sensitive strain of *Escherichia coli*.

J. Bact. 1953 : 65 : 383-87.

Both the lysogenic strain K-12 and W-1485, a mutant form of K-12 sensitive to phage, showed marked reduction in viability after X irradiation. In a lactose medium only K-12 possessed the capacity for adaptation, being able to form lactase. The release of lactase was found to occur at the same time as the liberation of phage by the lysis of cells in which the production of λ had been induced by X rays.

2409 STAPLETON, G. E., BILLEN, D. & HOLLAENDER, A.

Recovery of X-irradiated bacteria at suboptimal incubation temperatures.

J. Cell. Comp. Physiol. 1953 : 41 : 345-57.

Escherichia coli B/r proved to be capable of

recovering from lethal effects of X rays if incubated at once in the presence of abundant nutrients at temperatures of 6-30° C, which are below those normal for growth. Recovery cannot be attributed either to nonphysiological decay of a radiation-induced toxic substance or to stimulation of early cell division in irradiated cells. It was noted that the percentage survival for three strains of *E. coli*, Crooks, B/r, and Texas, at a constant dose of X radiation, was essentially the same when each strain was incubated at the optimum temperature for recovery. This suggests that strain differences, in respect of radiation sensitivity, may reflect the recovery possible after irradiation.

2410 BERGER, H., HAAS, F. L., WYSS, O. & STONE, W. S.

Effect of sodium azide on radiation damage and photoreactivation.

J. Bact. 1953 : 65 : 538-43.

In the presence of sodium azide, the sensitivity of *Chromobacterium violaceum* ATCC 7461, *Escherichia coli* B/r and *Micrococcus pyogenes* var. *aureus* to the lethal effects of ultraviolet radiation was reduced; similarly, sodium azide also reduced the degree of photoreactivation subsequent to ultraviolet radiation. Treatment of resting cells with sodium azide prior to irradiation produced essentially the same results; postirradiation treatment, however, had no effect on the percentage of survivors of ultraviolet radiation but reduced photoreactivation. The number of spontaneous and ultraviolet-induced mutants for streptomycin resistance in "catalase-rich" strains of *M. pyogenes* var. *aureus* was increased in the presence of sodium azide.

The possibility that further investigations on quantitative aspects of azide treatment will elucidate interrelationships between ultraviolet inactivation, mutagenesis and photoreactivation is discussed.

2411 YUDKIN, J.

Origin of acquired drug resistance in bacteria.

Nature, Lond. 1953 : 171 : 541-46.

A theory of clonal variation with selection is put forward to explain some phenomena of acquired drug resistance. The theory is based upon the assumption that a bacterial cell divides with a balanced asymmetry in respect of resistance, one daughter cell possessing a higher resistance than the parent by a small fixed amount, and the other daughter cell having a lower resistance by the same amount. The distribution curves

of resistance in populations grown in the absence of drug and in the presence of moderate and high concentrations are constructed and explained. It is argued that the following four features of acquired resistance cannot be explained by either the theory of direct induction or the theory of mutation with selection, but that they can be interpreted satisfactorily in terms of the author's hypothesis: (1) graded resistance during subculturing; (2) apparent increase in degree of resistance with increasing size of inoculum; (3) cases of slower rate of growth of trained cultures in the presence of a drug than in its absence; and (4) different types of behaviour in respect to reversion. The results of experiments on differences in resistance between recently isolated and older cultures from a single cell, and on growth rate in the presence of a drug have been in agreement with the new theory.

- 2412 GARBER, E. D., NOBLE, K. & CAROUSO, N.
Genetic studies on the development of streptomycin resistance in *Pasteurella pestis*.
J. Bact. 1953 : 65 : 485-89.

Both virulent and avirulent strains of *P. pestis* proved very sensitive to streptomycin *in vitro* and *in vivo*. The rate of mutation from streptomycin sensitivity to resistance was relatively low, being 10^{-11} mutations per bacterium per division cycle in avirulent strains, A-1122 and A-1122NS, and 10^{-12} in the virulent strain 139-L. Four of seven fully resistant colonies recovered from 139-L were avirulent, suggesting that the resistant cells had lost their virulence as a consequence of mutation to streptomycin resistance.

- 2413 HAAS, F. L., WYSS, O., BERGER, H. & STONE, W. S.
Induction of mutations to antibiotic resistance in bacteria.
J. Bact. 1953 : 65 : p. 354.

Results of further investigations with *Escherichia coli* B/r and 10 strains of *Micrococcus pyogenes* var. *aureus* support previous findings that resistance to antibiotics can be induced by ultraviolet irradiation (cf. *PBA*, Vol. XVII, Abst. 1585). These observations are contrasted with those of Saz *et al.*, who were unable to induce resistance to penicillin or streptomycin in *M. pyogenes* var. *aureus* either by direct or indirect ultraviolet irradiation. The authors believe that oxidized substances produced

within the cell by the irradiation have an important mutagenic function.

- 2414 GROMAN, N. B.
The relation of bacteriophage to the change of *Corynebacterium diphtheriae* from avirulence to virulence.
Science 1953 : 117 : 297-99.

No support has been found for the view that the change from avirulence to virulence upon exposure to bacteriophage is due to the occurrence of spontaneous mutants and their subsequent selection by the action of the bacteriophage (cf. *PBA*, Vol. XXII, Abst. 948 and 2499). Virulent cells appeared at rates far in excess of the expected frequency of natural mutation, and in the absence of phage no virulent colonies have been produced. The change is thought to be induced by the action of the phage as a particulate transforming principle, a causal relationship existing between lysogenicity and virulence. Lysogenicity, it is suggested, results in an altered metabolism of the avirulent cells so that toxin is produced.

- 2415 NEWCOMBE, H. B.
The delayed appearance of radiation-induced genetic change in bacteria.
Genetics 1953 : 38 : 134-51.

It has been observed that approximately 13 cell generations occur before the bulk of ultraviolet-induced mutations of *Escherichia coli* to phage T1 resistance are expressed. Analysis of sectoring in colonies grown from single irradiated cells has established that gene mutation may not occur until some time after irradiation, being delayed until just before or after the time of the first division; subsequent segregation is then necessary before the mutation influences the phenotype. It has also been suggested that the phenotypic expression of a mutant gene may depend on a preliminary period of metabolic activity. A combination of such factors will, however, merely delay the appearance of genetic changes for 3 to 5 generations. The discrepancy between the expected expression after 5 generations and the observation of phage resistance after 13 generations was not found in similar experiments using streptomycin instead of a living selective agent. Thus the author considers that the delay in expression of phage resistance depends on the specific action of irradiation on the rate of phage selection, prolonging a bacterial response normally characteristic of the lag period; this is termed a selection artefact.

2416 CARVAJAL, F.

Phage problems in the streptomycin fermentation.

Mycologia 1953 : 45 : 209-34.

The experiments included a study of the effects of phage upon a sensitive culture of *Streptomyces griseus*. Phage action led to the appearance of variant colonies, differing considerably in cultural, morphological and biochemical characteristics, and comparable with mutants produced by nitrogen mustard and by ultraviolet radiation and X rays. The mutant colonies exhibited varying degrees of phage resistance; a few cultures were immune, giving consistently high yields of streptomycin and B₁₂. In work on mutation of *S. griseus* to obtain improved production of streptomycin and B₁₂, use is being made of phage, either alone or in combination with radiation and chemical mutagens.

2417 ROWELL, J. B., STAKMAN, E. C. & BUTLER, E. E.

The mutagenic action of dilute colloidal polonium on fungi.

Minnesota Univ. [undated] (AECU-1823) : Pp. 6.

[from Nuclear Sci. Abstr. 1952 : 6 : Abstr. 1085].

Lethal and mutagenic effects resulting in reduced rates of growth and reproduction were readily induced by exposing vegetative cells or spores of *Penicillium Roquefortii*, *Saccharomyces cerevisiae*, *Chaetomium globosum* and *Ustilago Zeae* to 0.5-1.0 µc./ml. aqueous polonium for 2, 4, 9 and 21 days, respectively, at 8° C. Under these conditions, visible mutations constituted 3.5, 6.1, 10.1 and 1.0%, respectively, of the cultures examined.

2418 UTIGER, H.

Eine neue chemische Reaktion zur geschlechtlichen Differenzierung von *Phycomyces blakesleeana* (+) und (-). [A new chemical reaction for the sexual differentiation of (+) and (-) *Ph. blakesleeana*].

Naturwissenschaften 1953 : 40 : 292-93.

Mycelia of - strains give a red colour reaction with NaOH when cultured on a medium containing the whole molecule of vitamin B₁; the + strains give no such reaction.

2419 TURK, A. & MESSER, P. J.

Green lemon mold. Gaseous emanation products.

J. Agric. Food Chem. 1953 : 1 : 264-68.

An ultraviolet-induced mutant of *Penicillium*

digitatum, differing from the parent strain in respect of failure to stimulate the respiration of lemons, was found to produce less volatile material than the nonmutant. Spectral analyses revealed significant qualitative chemical differences between emanations from the two strains.

2420 IMŠENECKIĚ, A. & PEROVA, K.

(The development of amylase by rough strains of *Aspergillus niger*).

Dokl. Akad. Nauk SSSR (Rep. USSR Acad. Sci.) 1951 : 81 : 685-87. [Russian].

A rough strain, AN5, with an intensified capacity for breaking down starch, was obtained experimentally from a smooth culture.

2421 KANIE, M.

Diastase formation by *Aspergillus*.

Mem. Fac. Agric. Kagoshima Univ.

1952 : 1 : 87-112.

The paper includes a description of a spontaneous mutant of *A. Kawachii* with diastatic properties differing from those of the parent strain. The variant had lower β amylase and maltase activity than the parent but higher α amylase activity.

2422 GATTANI, M. L.

White nonsporulating mutants of *Penicillium notatum chrysogenum* induced by radioactivity.

Curr. Sci. 1952 : 21 : 167-68.

Four white mycelial variants were among those induced by adding uranium nitrate to the medium. Lack of spore production was partial in two of these mutants, and complete in the other two. The former developed green spore-producing sectors, resembling those of the usual type, and also producing green colonies. The four variants all yielded less penicillin than the parent strain.

2423 POHJAKALLIO, O., SALONEN, A. & RELANDER, E.

Investigations into the micro-organisms limiting damage by the clover rot fungus.

Acta Agric. Scand. 1953 : 3 : 53-60.

Strains of *Pseudomonas* spp. isolated from clovers in Finland have shown differential antibiotic effects on *Sclerotinia Trifoliorum*. It is assumed that variability in the severity of clover rot in different regions is correlated with the incidence of these strains.

2424 STANTON, W. R.

Field variation in *Venturia pirina*.

Trans. Brit. Mycol. Soc. 1953 : 36 : 90-103.

An analysis of variability in respect of cultural characteristics was carried out with 80 isolates of *V. pirina* from pears grown in different parts of England. Segregation data for ascospore isolates indicate that thiamin requirement, colonial form and colour, and various mycelial features are controlled by single genes. By grouping isolates on the basis of colony size (*L*), aerial habit (*A*), regular margin (*R*), and presence of central boss (*B*), 14 of the possible 16 combinations were identified; *LARb* occurred in culture only, while *LARb* was not found. The alleles *l*, *a*, *r* and *B* were represented more frequently than *L*, *A*, *R* and *b*, but no correlation was found between the different isolates and the hosts from which they originated. In fact, isolates differing widely in many respects were obtained from the same tree.

2425 NORMAN, A.

Inactivation of *Neurospora conidia* by ultraviolet radiation.

Exp. Cell Res. 1951 : 2 : 454-73.

Data are presented to show that only quanta absorbed within the nucleus can lead to nuclear inactivation. Interdependence of inactivation by lethal mutations and by nongenetic processes has been established; both genetic and nongenetic effects are reduced to the same extent by photoreactivation (cf. *PBA*, Vol. XXII, Abst. 1673).

2426 RYAN, F. J., KUNIN, C. & BALLENTINE, R.

Unique sensitivity of a pantothenic-less mutant of *Neurospora* to constituents of the growth medium.
J. Bact. 1953 : 65 : 434-39.

N. crassa 5531 A, secured after X irradiation, was found to have a requirement for pantothenate varying with the concentration of biotin or inorganic salts in the medium; concentrations optimum for the wild type, or for the mutant grown in an abundant supply of pantothenate, inhibited growth of the mutant in the presence of low concentrations of pantothenate. When the mutant was crossed with the albino wild type, 43 out of 128 progeny isolates were pantothenicless. Further studies with 27 of the 43 isolates showed that the albino character was inherited independently. At least three types were detected with respect to salt concentration: (1) as sensitive as the original mutant, growing best on 50% minimal

Diseases, Injuries, Bacteria, Fungi, Viruses *continued*.

medium; (2) inhibited as much by 50% as by 100% minimal medium; and (3) not inhibited by either medium. Several complementary genes are assumed to determine this sensitivity.

2427 STRAUSS, B. S.

Properties of mutants of *Neurospora crassa* with low pyruvic carboxylase activity.

Arch. Biochem. Biophys. 1953 : 44 : 200-10.

The behaviour of the *car* mutants for low pyruvic carboxylase activity is fully described (cf. *PBA*, Vol. XXIII, Abst. 935).

2428 BEVAN, E. A.

Genetic analysis of intact incomplete asci of yeast.

Nature, Lond. 1953 : 171 : 576-77.

Using mating type and two monogenically determined nutritional requirements as marker characters, it has been demonstrated that Mendelian analysis of intact asci with one, two or three spores is feasible, and in some cases labour-saving.

2429 LINDEGREN, C. C.

Gene conversion in *Saccharomyces*.
J. Genet. 1953 : 51 : 625-37.

Families selected from a long pedigree were analysed with respect to all the complete 4-spored asci heterozygous for *MAma*, controlling maltose fermentation, and for *MGmg*, governing fermentation of α -methyl glucoside. Regular dihybrid segregations occurred in most asci. Most of the irregular asci could only be explained as the result of the conversion of a dominant gene into a recessive allele in the heterozygote. The aberration consisted of the production of an excess of recessive genes when a regular 2 : 2 segregation was expected. Since conversion of the dominant gene occurred while another gene on the same chromosome was unaffected, chromosome loss or polyploidy could not be the cause of such irregularity. The — genes arising by conversion from + to — at meiosis differed from the more stable — genes in the inbred stock with respect to their ability to revert to the + condition while proliferating in a medium in which the + gene has a selective advantage. This phenomenon suggests that conversion of + to — frequently involves a change in which all the + material is not removed from the + locus, and that unequal division of the chromosomes during mitosis may enable the locus to accumulate a sufficient amount of + material to exhibit the + phenotype.

2430 WILES, A. E.

The practical significance of some recent yeast researches.

Brew. Guild J. 1953 : 39 : 185-95.

Reference is made to the possibility of applying the results of genetical investigations to future programmes of hybridization to combine desirable degrees of flocculation and fermentation. The frequency of mutation in brewery cultures is also briefly discussed.

2431 SLONIMSKI, P. P. & HIRSCH, H. M.
Nouvelles données sur la constitution enzymatique du mutant "petite colonie" de *Saccharomyces cerevisiae*. (**New data on the enzyme constitution of the "small colony" mutant of *S. cerevisiae***).

CR Acad. Sci. Paris 1952 : 235 : 741-43.

In the small-colony mutant, cytochrome a and b, and four of the usual respiratory enzymes are absent, while six other respiratory enzymes occur in reduced quantity; the content of lactic dehydrogenase, is, however, little different from that of the normal type. It is noteworthy that the enzymes that are completely suppressed are those attached to particles which can be separated out by centrifuging.

2432 SCHANDERL, H.

Die spontane und künstliche Verwandlung von Sprosspilzen (Hefen) in Spaltpilze (Bakterien). (**The spontaneous and artificial conversion of yeast fungi into bacteria**).

Naturwissenschaften 1953 : 40 : 296-97.

Single-spore cultures of yeast left unopened for over 12 months in a culture medium at pH 4.8-6.2 were partially or entirely converted into bacteria (cf. *PBA*, Vol. XX, Abst. 799).

2433 IERUSALIMSKIĬ, N. D.

(**Directed variability in relation to breeding microorganisms**).

Vestnik Akad. Nauk SSSR (Rec. Acad. Sci. USSR) 1952 : No. 1 : 68-73. [Russian].

A more detailed account of the conference on microbiology than that previously reported in *PBA*, Vol. XXII, Abst. 2515 is given.

2434 KVASNIKOV, E. I.

(**Some principles for breeding industrial organisms**).

Mikrobiologija (Microbiology) 1952 : 21 : 71-76. [Russian].

The discussion of various questions relating to

breeding microorganisms (cf. Absts. 2435, 2436, 2437 and 2438) is continued.

Some promising wild strains of microorganisms have been selected in Uzbekistan. They included RC-6, a race of yeast which makes good champagne. The method of continuous selection of microorganisms in industry is also accepted with some qualifications. In the case of yeasts, sexual hybridization is regarded as promising. Heritable changes in microorganisms can be obtained by any of the following methods: (1) by culturing several microorganisms upon the same medium; (2) by culturing them when separated one from the other by semiporous films; (3) by stimulating the enzymic processes of some microorganisms by adding to the nutrient media other dead microorganisms, extracts from other microorganisms or products of their enzymic activity; and (4) by using mutagenic substances, extracted by chemical methods from the cells of microorganisms.

The method of using strain mixtures has so far been disappointing in the wine, alcohol and brewing industries. However, joint culturing of yeasts and some *Lactobacterium* spp., found in close association in nature, might prove a useful method of directing changes in yeast cells. The present writer cultured the yeast RC-6 with strain 114 of *Lactobacterium Buchneri* and obtained an improved strain of yeast for making wine, *RM*, which synthesized smaller amounts of esters and formed settled lees.

2435 RJABČENKO, I. M.

(**The method of continuous breeding of microorganisms in industry**).

Mikrobiologija (Microbiology) 1952 : 21 : 77-82. [Russian].

The principle of continuous selection of microorganisms (cf. Abst. 2434) is accepted but a detailed study of its application to industrial conditions is urged. Hybridization and directed training are regarded as promising for developing new forms of yeasts. References are made to the development of inferior yeast strains from some pure cultures used for making wine. The changes are attributed to the effects of external conditions, and, particularly, to maintaining the yeasts in museum cultures. Several improved strains were selected at the Abrau-Djurso Champagne Trust. The properties of some new yeast forms remained constant when they were cultured upon grape juice or grape juice and agar for periods up to 3 years.

2436 GAMOVA-KAJUKOVA, N. I.

(Breeding useful microorganisms for the food industry).

Mikrobiologija (Microbiology) 1952 : 21 : 83-86. [Russian].

Some questions related to breeding microorganisms for the vinegar and dairy industries are discussed in the light of the preceding discussion (cf. Abst. 2435). A pure strain of *Bacterium curvum* has shown promise in the vinegar making plants in Moscow and Kazanj. Good results with pure strains were also obtained at other vinegar producing centres. Reference is made to *Acetobacter nikitinskii*, selected from some aromatic Georgian vinegars, which causes only mild acetic fermentation. The criteria for selection of microorganisms for the vinegar industry are outlined and investigations of mixed cultures are advocated. Directed training of some dairy bacteria and genetical research, especially of *Streptococcus cremoris* and *S. citrovorus*, are urged.

2437 KIRJJALOVA, E. N.

(The paper by V. I. Kudrjavcev on "continuous breeding of microorganisms in industry").

Mikrobiologija (Microbiology) 1952 : 21 : 92-95. [Russian].

The breeding methods, advocated by Kudrjavcev (cf. Abst. 1744), differ little from existing practices. Many active strains of yeasts causing alcoholic fermentation of various fruit juices have been developed in recent years. No changes were observed in many pure strains maintained in museum cultures for periods of 1-30 years, but it is thought that the methods of maintaining yeast cultures can be improved. Directed training is regarded as the most promising method for developing new forms of yeasts with good economic properties. In this connexion, investigations of the interspecific relations between microorganisms are recommended.

2438 IMŠENECKIĬ, A. A.

(The results of the discussion of questions relating to the breeding of microorganisms).

Mikrobiologija (Microbiology) 1952 : 21 : 257-64. [Russian].

This paper concludes the discussion, begun by Kudrjavcev (cf. Abst. 1744), with a critical analysis of the various reports. Continuous selection of industrial microorganisms, advocated by Kudrjavcev, is accepted as a breeding method. The views of some other writers that

it is of little practical value or that it leads inevitably to deterioration of cultures are rejected. However, some shortcomings of the method, including a quick deterioration of some pure cultures or their contamination in certain industries, are pointed out. Some industrial strains, cannot acquire resistance to other microorganisms because of their sterile environment. The method is most promising for developing improved strains of yeasts. Several writers, who regard hybridization and training of microorganisms as more efficacious methods of breeding than selection of wild or industrial strains, are supported. Breeding methods involving the use of chemical agents are regarded as of little practical value. The principle of maintaining pure strains in museum cultures for renewing industrial stocks of microorganisms is approved, but it is suggested that laboratory research should also include investigations on: (1) directed training of microorganisms; (2) methods of maintaining their economically important properties; (3) causes for deterioration of some pure strains when cultured under laboratory conditions, and (4) the taxonomy of economic forms of microorganisms.

2439 LOGINOVA, L. G.

(The fermentation of maltose by thermophilic yeasts).

Mikrobiologija (Microbiology) 1952 : 21 : 684-91. [Russian].

A new thermophilic strain of yeast capable of fermenting maltose at 40° C. was obtained by culturing strain 12 of *Saccharomyces cerevisiae* at a high temperature.

2440 BOGDANOV, V. M.

(Using yeast cultures for making butter).

Mikrobiologija (Microbiology) 1952 : 21 : 321-29. [Russian].

Torulopsis strains K3 and 12, which improve the keeping properties and flavour of butter, have been selected.

2441 MOISEENKO, L. F.

(Economic properties of the yeast strain Kahuri-10).

Vinodelie Vinogradarstvo SSSR (Wine-making Viticult. USSR) 1953 : No. 5 : 8-10. [Russian].

An active strain for making good quality champagne, Kahuri-10, has been selected at the Magarač institute. It is tolerant of sulphurous acid and is capable of fermentation at 8-12° C.

2442 IMŠENECKIĀ, A. A.

(The synthesis of proteins in cultures of a rough form of *Saccharomyces cerevisiae*).

Mikrobiologija (Microbiology) 1952 : 21 : 3-13. [Russian].

A rough strain, AN₂, was selected from a normally smooth form of *S. cerevisiae*. It differs from the initial strain in respect of size and shape of the cell and in its colony formation. The smooth and rough forms synthesized equal amounts of proteins when cultured under anaerobic conditions, but AN₂ was more productive on the surface of cultures and in aerated nutrient solutions.

2443 MUNDKUR, B. D.

Mitochondrial distribution in *Saccharomyces*.

Nature, Lond. 1953 : 171 : 793-94.

The variation in frequency of mitochondria from 1 to 18 per cell bore no relation to differences in cell size. In addition, no association was detected between mitochondrial count and relative size of bud, nor between counts of mother and bud cells. Distribution of mitochondria is therefore concluded to be random. The observations suggest that buds with only a single "mutant" mitochondrion, or without any normal mitochondria, will yield clones of "vegetative mutants" breeding true to type. In view of the possible localization of certain enzymes in the mitochondria, this mode of origin of vegetative mutants may explain irregularities in the final expression of genetical characters determined through the mediation of mitochondrial enzymes.

2444 PRAHLADA RAO, L. S. & SUBRAMANIAM, M. K.

Studies on the cytology of yeasts. Part VII. Nuclear phenomena in cells from 24-hour agar slants.

Proc. Indian Acad. Sci. 1953 : 37 : Sect. B : 72-81.

Photomicrographs showing cytological behaviour under aerobic and anaerobic conditions are presented to illustrate the confusion which may arise from interpretations made without reference to the influence of cultural conditions. Endopolyploidy, observed in cells from agar slants, is considered to be a modification to meet these restricted conditions of growth.

2445 SUBRAMANIAM, M. K.

Abnormal mitoses in tetraploid yeasts.

Proc. Indian Acad. Sci. 1953 : 37 : Sect. B : 27-32.

Descriptions of abnormal mitotic configurations in which the 8 chromosomes segregate into groups of 5 and 3 or 6 and 2 are supplemented by photomicrographs. The possibility that these daughter cells with irregular chromosome complements may give rise to new diploid and polyploid strains is discussed, with reference to the failure of Winge and Lindegren to recognize the occurrence of polyploidy.

2446 LUCKE, W. H. & SARACHEK, A.

X-ray inactivation of polyploid *Saccharomyces*.

Nature, Lond. 1953 : 171 : 1014-15.

In experiments at the Biological Research Laboratory, Southern Illinois University, Carbondale, evidence has been obtained that a one-to-one relationship exists between degree of polyploidy and number of targets per cell. The possible genetic causes of differences in survival are discussed.

2447 SHEFFNER, A. L.

Relationship between the oxidative and fermentative phases during adaptation to galactose in *Saccharomyces cerevisiae*.

Nature, Lond. 1953 : 171 : p. 1073.

Data have been obtained suggesting that the onset of galactose fermentation is dependent upon the preliminary accumulation of reserve and intermediate substances which are stored from the commencement of adaptation to galactose. Spiegelman's view that galactokinase synthesis is autocatalytic is therefore regarded as invalid, and his hypothesis of extra-chromosomal hereditary factors is thought to be a premature explanation of the kinetics of galactokinase formation.

2448 RAUT, C.

A cytochrome deficient mutant of *Saccharomyces cerevisiae*.

Exp. Cell Res. 1953 : 4 : 295-305.

An ultraviolet-induced mutant, W-1, of a haploid strain of *S. cerevisiae* was unable to absorb O₂ owing to a deficiency of cytochromes a and b, and a marked reduction in cytochrome c. In crosses with normal cultures, this deficiency proved to be determined by a single mutant gene. After a few weeks many back mutations to the normal condition were observed. Normal diploids were obtained when W-1 was crossed with a cytochrome-deficient haploid designated petite; all haploid segregants were either normal or of the W-1 type, but petite colonies appeared when some normal spores were plated. These results suggest that the

petite clones may be genetically normal, cytochrome deficiency in this case being due to the absence of a cytoplasmic factor.

2449 AHMAD, M.

Biochemical investigations in *Saccharomyces*.

Bull. Torrey Bot. Cl. 1953 : 80 : 197-204.

Investigations were carried out on the vitamin requirements of 11 strains of *Saccharomyces*. Two strains were autotrophic; the remainder were heterotrophic. Capacity to synthesize methionine and pyridoxine was dominant to inability. The hybrid between a strain of *S. cerevisiae* and another of *S. carlsbergensis*, both unable to synthesize pantothenic acid, produced β -alanine and thus pantothenic acid; at least two genes are therefore involved in synthesis of pantothenic acid.

2450 FURUTANI, Y., BETZ, R. F. & HEDRICK, L. R.

Vitamin requirements of *Hansenula* yeasts in relation to their phylogeny.

J. Bact. 1953 : 65 : 276-80.

On the basis of an analysis of the vitamins required by 35 strains of *Hansenula* spp., the author considers that predominantly and exclusively haploid strains have greater requirements than diploid individuals, except when the latter are ecologically restricted.

2451 AHMAD, M.

Mating of cells of the same mating type in heterothallic *Saccharomyces*.

Cellule 1953 : 55 : 233-42.

The mating reaction and capacity for sporulation were tested in 48 colonies grown from zygotes obtained by crossing 8 (+) and 8 (-) haploid cultures of a heterothallic strain of *S. cerevisiae*. Occasionally, cells belonging to the same mating type fused after stimulation by cells of the opposite mating type, giving rise to small round cells which cannot form spores and possess the capacity of mutating to the opposite mating type. Such characteristics suggest that these cultures are haploid rather than diploid, but it is as yet uncertain whether homozygous mating is followed by nuclear fusion.

2452 POMPER, S. & MCKEE, D. W.

Mutation of mating type in *Saccharomyces cerevisiae*.

Science 1953 : 117 : 455-56.

Evidence has been obtained of spontaneous mutation of mating type a to α in one parent prior to a cross between two a haploids.

2453 AHMAD, M.

The mating system in *Saccharomyces*.

Ann. Bot., Lond. 1953 : 17 : 329-42.

Colonies grown from single ascospores of a heterothallic strain of *S. cerevisiae* known as Danish Baking Yeast were sometimes found to contain vegetative cells of opposite mating type, which had presumably arisen by mutation of the mating-type allele. Mutation was followed by conjugation between + and - types and formation of diploid zygotes, capable of yielding + and - progenies. Diploid cells formed by budding showed a faster growth rate than their haploid parents and therefore possessed a selective advantage. Thus, soon after mutation, cultures comprised haploid individuals of + or - mating type and diploid sporulating cells, but after five days the haploid culture was completely replaced by diploid sporulating cells. The Brewers' Yeast strain of *S. cerevisiae* proved to be homothallic; other species of *Saccharomyces* examined, including *S. carlsbergensis*, had mating systems similar to Danish Baking Yeast.

2454 SCHERR, G. H. & WEAVER, R. H.

The dimorphism phenomenon in yeasts.

Bact. Rev. 1953 : 17 : 51-92.

The effects of nutritional factors, age, temperature, carcinogenic chemicals and irradiation on the relative predominance of unicellular or filamentous mycelial phases are reviewed. A discussion of concepts concerning the mechanism by which dimorphism occurs touches briefly on the possible influence of auxins, inactivations of -SH groups, growth rate mechanisms, mutation and selection. The author considers it probable that at least two or more of these concepts may be necessary to explain the phenomenon.

2455 HOLTON, C. S.

Physiologic specialization and genetics of the smut fungi. II.

Bot. Rev. 1953 : 19 : 187-208.

Research carried out during the last 12 years is surveyed, forming a supplement to the original review of Christensen and Rodenhiser (cf. *PBA*, Vol. XI, Abst. 99). Particular attention is given to the coordination achieved between investigations of racial differentiation and the breeding of smut resistant cereals. Much of the work reviewed is concerned with sex compatibility and analysis of multiple factors controlling pathogenicity, spore morphology, germination, lysis and mutability.

- 2456 HIRSCHHORN, E.
Variaciones en *Ustilago Zeae*. (Variations in *U. Zeae*).
Cienc. e Invest. 1953 : 9 : 158-65.

U. Zeae was less resistant to the effect of formaldehyde than were *U. scitaminea* and *U. bullata* and descriptions are given of a chlamydosporous variant that resulted from treatment of some 20,000 sporidia of *U. Zeae* with gaseous formaldehyde. It was constant when reproduced vegetatively and did not in any way alter the pathogenic properties of the strain; it was however somewhat more tolerant of formaldehyde than the parent strain. It did not remain pure when reproduced sexually.

- 2457 ROBERT, A. L.
Cultural and pathogenic variability in single-conidial and hyphal-tip isolates of *Helminthosporium turcicum* Pass.
Tech. Bull. US Dep. Agric. 1952 : No. 1058 : Pp. 18.

Single conidial isolates from seven American states differed in their ability to infect the Mellum strain of the maize Minnesota 13; they were also distinguishable in culture, with respect to colour and form of mycelia, rate of growth and production of conidia. These variants of *H. turcicum* cannot, however, be considered as separate races, since the degree of virulence altered from one year to another, while subcultures taken from hyphal tips originating from the same conidium also differed from the parent culture and from each other in both cultural characteristics and pathogenicity. It is considered that the marked instability may be due in part to mutation accompanied by the selective effects of environment.

- 2458 BARNETT, H. L.
A unisexual male culture of *Chalara quercina*.
Mycologia 1953 : 45 : 450-57.

One isolate of *Ch. quercina*, belonging to the A compatibility group (cf. Abst. 127), showed the genetically determined character of unisexual maleness. Its compatibility segregated independently of sexual behaviour and colour of mycelium. The latter two characters may be genetically linked, loss of femaleness usually being accompanied by the apparent loss of dark colour. Other isolates have exhibited a similar inability to act as female. It is not yet known whether unisexual male mutants also occur in nature.

- 2459 BLACK, F. L. & KNIGHT, C. A.
A comparison of some mutants of tobacco mosaic virus.
J. Biol. Chem. 1953 : 202 : 51-57.

Seven strains of tobacco mosaic virus maintained at Berkeley, Calif., comprising two independent series of mutations from a single parent type, were shown to differ from one another and from the original strain in respect of protein composition. No significant deviations with respect to nucleic acid composition were noted. It was impossible to determine the number of steps involved in mutation from one strain to another in either series; nor could any relationship be established between protein composition and pathogenic symptoms.

- 2460 STENT, G. S.
The multiplication of bacterial viruses.
Sci. Amer. 1953 : 188 : No. 5 : 36-39.

The use of radioactive isotopes, P³², S³⁵ and N¹⁵, for tracing the hereditary continuity of virus desoxyribonucleic acid in phage infecting and multiplying within bacteria, is reviewed in a popular manner.

CROP PLANTS

- 2461 Twenty-first Annual Report of the Minister for Agriculture, Dublin 1951-52 : Pp. 185 + 87.
Special technical and advisory work.
Seed Propagation Division. (pp. 82-87).

Reports are given of trials of barley varieties and selections, including the test forming part of the European Brewery Convention series.

Appendices. Report of the Agricultural Department, University College, Dublin, for the year 1951-52: (pp. 1-19).

Wheat. In winter wheat breeding for high yield, strong straw and resistance to *Puccinia glumarum*, promising strains have been produced from Redman x Pajbjerg, Redman-Pajbjerg x Glasnevin Rosa and Alba x Glasnevin Rosa. The crosses Kärn [Kernel] x Fylgia, Kärn x Cascade and Progress x Cascade have provided valuable winter wheats.

Oats. Small quantities of seed of Glasnevin Potato will be available for distribution in 1953 (cf. PBA, Vol. XXII, Abst. 1704). Among the hybrid types now being developed, Glasnevin Bonstar and two strains of Richie 34/75 x Success show most promise.

Barley. Strains highly resistant to lodging and with good malting quality have been

produced, including two selections from Kenia x Spratt Archer.

Grasses and legumes. Five improved strains of cocksfoot are being developed, one of which appears to be winter green. Breeding of timothy, meadow fescue and other grasses is also receiving attention. A late-flowering red clover strain of the Montgomery type has been distributed. Lucerne breeding has been initiated.

Raspberry. Promising hybrid selections are under observation.

Vegetables. Work on selected strains of Brussels sprouts continued. Progress has been made in tomato breeding for resistance to *Cladosporium* (cf. *PBA*, XXII, Abst. 1704).

2462 Fifth Conference on Plant Breeding, Bayfordbury, 24th-26th July 1952.
Heredity 1953 : 7 : 143-48.

Lewis, D. Aims and methods in plant breeding. (pp. 143-44).

Breeding history in relation to the aims of improvement of a particular crop are discussed. The value of rapid and efficient techniques of testing for such characters as disease resistance and processing qualities, and of controlled environment chambers, is stressed. Evidence has been obtained by the author, working on tomatoes, and by other investigators, that F_1 hybrids have a greater phenotypic stability than the parents. If this greater stability is found to be of a general nature, increased use of F_1 hybrids should be aimed at, facilitated by genetic emasculation resulting from genic or cytoplasmic male sterility, or from self incompatibility.

Horne, F. R. Reproduction of improved stocks. (pp. 144-46).

Problems of the production of seed stocks of cereals and other crops are considered, with reference to the work of the National Institute of Agricultural Botany, Cambridge, in connexion with certification schemes in Britain.

Whitehouse, R. N. H. Breeding for yield in the cereals. (pp. 146-47).

Difficulties involved in the population method, pedigree method, evaluation of single plants and in small-scale yield trials are discussed, with reference to experience at the Plant Breeding Institute, Cambridge.

In trials of early generations of unselected hybrids, winter wheat crosses have given much higher yields than spring wheat crosses, com-

pared with their respective parents. This may be due to segregation of the latter into early and late maturing types, followed by natural selection against the late plants. If this is so, the method would be invalidated, since absence of selection is an essential condition. The pedigree method may be modified by limiting selection to the F_2 and F_3 generations, and then growing the progenies of selected F_3 plants in the F_4 and later generations. Finally, single plant selections must be made within the high-yielding progenies. The weakness of the method lies in the small number of progenies which can be adequately tested, although use of cubic lattice designs may be of service. The modification is most applicable where F_2 and F_3 selection can be very intense, thus reducing the number of progenies to be tested. In evaluating single plants, hybridization between two varieties with a high expression of the different characters forming the components of yield may be more productive than merely crossing the highest yielding varieties. The effects of seed rate upon the validity of dibbed trials are under investigation.

Haigh, J. C. Variety testing. (pp. 147-48).

Early testing and selection of variable breeder's material under a wide range of conditions are advocated.

Lawrence, W. J. C. New techniques in plant breeding. (p. 148).

In addition to temperature and light control to condition flowering, several aids used by breeders outside Britain are referred to, such as the electric "bee", liquid air for storing pollen and mobile glasshouses.

2463 Report of the Crop Conference held at the Cambridge Union Society on 16th and 17th December, 1952.

J. Nat. Inst. Agric. Bot. 1952 : 6 : 287-334.

Contributions concerning research in the United Kingdom included the following: *Wheat varieties* by E. G. Thompson, outlining the development of wheats for specific uses and emphasizing the value of some Scandinavian and other European introductions; *Strains of fodder beet* by W. E. H. Fiddian, discussing the merits of different strains of mangel, fodder sugar beet and sugar beet for fodder; and *Potato varieties* by J. C. Cullen, outlining the progress of breeding for disease resistance and describing the adaptability of varieties to different environments.

2464 **Forty-third Annual Report of the John Innes Horticultural Institution for 1952 (1953) : Pp. 31.**

Crane, M. B. Pomology Department. (pp. 6-10).

Apple and pear. A comparison of growth rate and branching in diploid and triploid first-year apple seedlings showed that diploids were at first taller and more vigorous than triploids, but the latter began to catch up with the diploids by the end of the season. Production of lateral shoots varied with parentage and seemed independent of the degree of polyploidy.

Seeds obtained from the diploid pear Fertility, whose ovaries were treated with β -naphthoxy-acetic acid before dusting with diploid and triploid apple pollen, were assumed to have an apomictic origin. Developing seedlings, however, possessed characteristics intermediate between both parents, indicating their hybrid origin; those derived from tetraploid apple were triploids and those from diploid apple were diploids (cf. Abst. 2939). All seedlings had a somewhat defective root system, but 11 have survived. Further crosses between tetraploid apples and pears are to be attempted using the same technique.

Most of the pear trees X-irradiated by 2500 r. flowered and set seed, while none which experienced 5000 r. blossomed.

F₁ pear seedlings from Beurré Giffard x Dr. Jules Guyot and the reciprocal cross have shown resistance to one or other of two strains of *Venturia pirina*, each isolated from one of the parents.

Only eight seedlings were immune from both strains, but a larger number showed a high degree of resistance.

Cherry. Varieties grown commercially were found to have differential means with respect to number of stamens. Segregation ratios for intervarietal hybrids suggest that these means are polygenically determined.

Rubus. With a view to genetical analysis, hybridization and selfing have been attempted with the following hybrids derived from crosses between blackberry and raspberry: Veitchberry (4x), Mertonberry (5x), Loganberry (6x) and Bedford Giant (6x).

In two families of the blackberry Merton Early, quantitative characters such as time of flowering and fruit maturity were highly uniform but showed weak correlation for individual plants. Family 31 comprised multiple progenies with closely overlapping limited segregation, whereas family 32 consisted of a single progeny with

limited segregation. Since fertilization was pseudogamous, no inbreeding depression could be detected in family 32. There was no segregation of major genes.

Strawberry. Selection for virus resistance is in progress at Trawscoed near Aberystwyth and at Bayfordbury, Herts., among clones bred at the Cambridge Horticultural Research Station. Nine seedlings raised at Bayfordbury proved promising in respect of resistance to mildew (*Sphaerotheca Humili*) and red core (*Phytophthora Fragariae*). Two decaploid selections (10x = 70) from the US Department of Agriculture have been incorporated in the breeding programme.

Tomato. In trials at Fairfield Experimental Station, Lancs., with varieties resistant and susceptible to *Cladosporium fulvum*, Antimold A (cf. PBA, Vol. XXII, Abst. 2530) gave higher yields than other resistant strains and proved superior to all varieties in respect of percentage of fruit in the select grades; it also possessed some root rot resistance.

A mutant lacking lateral shoots occurred in Antimold B; the F₁ from crosses with normal plants grew normally.

Hybrid vigour was shown by F₁ progenies of 125, a strain which fails to release its pollen, crossed with Potentate and Antimold A. Both hybrid progenies gave larger total yields and higher early yields than Potentate. The irregular fruit shape of 125, a multilocular strain, was improved by hybridization with bilocular varieties.

Sweet corn. Promising inbreds have been obtained from Dependogold and Northern Cross. Sugary derivatives of Cinquantino gave second generation inbreds which germinated early.

Lewis, D. Genetics Department. (pp. 11-16).

Forage legumes. The use of incompatibility to control pollination among self-fertile strains, without loss of vigour due to inbreeding, is being studied in red and white clover. Following X irradiation, selfed seed was obtained; both self-fertile and self-sterile plants were grown from this seed. It is hoped that the self-fertile individuals represent revertible mutations of S, comparable with those of *Oenothera* (cf. PBA, Vol. XXI, Abst. 2418), from which self-incompatible plants homozygous for S should be obtained.

Brassica. The possibility that hybrid vigour might result from intervarietal crosses has been investigated, using the following unrelated and

morphologically distinct parents: colewort, Red Drumhead, Greyhound and Winningstadt cabbages; Dwarf Curled, Cottager's and Russian kales; and Early, Late and Drumhead Savoy cabbages. Out of 17 crosses, 9 excelled the heavier parent with respect to total fresh weight. In respect of yield of heads, 5 out of 10 crosses between heading types proved superior to the better parents; the heading character was recessive in crosses of kale with either cabbage or savoy. It is considered that the occurrence of hybrid vigour in crosses between highly heterozygous varieties may be due to the combination of specific characteristics which supplement one another. A search for such varietal pairs possessing specific supplementary qualities is to be made.

Tomato. Heterosis in respect of (1) plant height and vigour and (2) ability to flower and bear fruit in the poor light of local winter conditions was noted in the F_1 of *Lycopersicon pimpinellifolium* x *L. esculentum*. Maximum vigour for (1) and (2) was seen when *L. esculentum* was the ♀ parent, suggesting an interaction between genes and cytoplasm. Further work to elucidate this relationship and procure a winter-fruiting variety is in progress; the full vigour for (2) was lost in the F_2 , but individuals with improved fruit setting appeared in a 1 : 15 ratio in the F_2 derived from ♀ *L. esculentum*. Genetical analysis of resistance to *Cladosporium fulvum* has shown that Antimold B, which is immune from race I and resistant to race II, is homozygous for two independent dominant genes determining resistance, Cf_{p1} and Cf_{sc} (cf. *PBA*, Vol. VIII, Abst. 57). Antimold A, resistant to races I and II, is homozygous for Cf_{sc} only. The resistance of Antimold B resembles that of the Canadian variety Vulcan, but the former is more suited to local conditions. Breeding for immunity to races I and II continues, using material derived from *L. peruvianum*. The breeding behaviour of a rogue tomato is reported. Segregation ratios in the F_1 , F_2 , F_3 and back-cross generations cannot be explained on a nuclear genetic basis. There is strong evidence for cytoplasmic control, the "normal-producing" cytoplasm having a suppressive effect on "rogue-producing" cytoplasm.

Darlington, C. D. *Cytology Department* (pp. 17-20).

Chromosome breakage. The results of recent work are summarized (cf. p. 658).

The behaviour of chromosome fragments of *Vicia Faba* suggests that both heterochromatin and a nucleolar organizer are necessary for these

fragments to survive as nucleoli. In *Trillium*, however, the centromeres appear to determine nucleolus formation.

Ultraviolet absorption following exposure to low temperatures has shown that the segments of heterochromatin in fixed but unstained chromosomes of *Trillium grandiflorum* are starved of nucleic acid.

Wheat. An extensive survey is being made of mitosis in pollen grains of diploid, triploid and hexaploid species of *Triticum*, and amphiploids of *Triticum*, *Aegilops* and *Agropyron*. Particular attention has been paid to the behaviour of univalents in the 21 monosomic lines of hexaploid bread wheat and F_1 pentaploids from *T. vulgare* x *T. dicoccum*. Some 6% of monosomics contained one or more new types of broken chromosomes, mostly telocentrics arising from misdivision of the centromere at meiosis. Such a process may provide a convenient method of reconstructing the chromosome complement in breeding.

Fruits. Chromosome studies in connexion with the following problems are mentioned: the occurrence of diploid and tetraploid chimeras in apple and pear; the progressive loss of chromosomes during growth in unbalanced seedlings from diploid x tetraploid crosses of apple and pear; intergeneric hybridization in the *Pyrus* group; and parthenogenesis and nonreduction, revealing block segregation in polyploid crosses between raspberry and blackberry.

2465 50 Jahre Bayerische Pflanzenzüchtung. Zum 50 jährigen Jubiläum der Bayerischen Landessaatzuchtanstalt Weißenstephan 1902-52. (50 years of Bavarian plant breeding. The 50 years Jubilee of the Bavarian State Plant Breeding Institute, Weißenstephan, 1902-52).

Landw. Jb. Bayern 1953 : 30 : Sonderheft : Pp. 259.

The jubilee volume starts with a historical account of the development of plant breeding in Bavaria, and of the Weißenstephan institute in particular. The organization of the institute and its dependencies is described, after which an outline is presented of the activities in each of the respective fields. These include the breeding work with the various crop plants as summarized below, the establishment of special chemical laboratories to investigate the factors determining quality in wheat, barley, fibre plants and other special crops, the organization of seed inspection schemes and the activities of

the various branch stations and private individuals and seed firms that work under the direction of the main institute. Each of these seed firms has one or more selections or hybrids which it markets, and the qualities of these varieties, most of which are specially suited for cultivation in the locality in question, are recorded. They include wheats such as Tuca, Firlbeck I, Tassilo and many others distinguished by high quality, Zapfs Neuzucht, known for its earliness, high tillering capacity and hardness under upland conditions with little snow covering, Walthari for its strength of straw, Siegfried and Bucher for their winter hardness, and Nordgau and Lichtis Weihenstephaner früh [Lichti's Weihenstephan Early] for earliness; a number of mildew-resistant barleys, including Erika, characterized by earliness, Isdania by drought resistance, Breuns Franken III by tolerance of acid soils and drought, Strengs Franken III by strong straw and Müllers Franken II by very high malting quality and low moisture requirements; Firlbeck II yellow oat, distinguished by strong straw, high nutritive content and frit fly resistance, the Endress oat and the NOS naked oat; Hochland [Highland] winter rye, tolerant of prolonged periods under snow, Karlshuld winter rye and Donaumoos spring rye, both tolerant of high moorland conditions, and the very early Johannis rye; several improved varieties of silage maize; and Strengs Frauenlob pea, which can be boiled without previous soaking.

Reference is also made to the work on producing maize inbreds for hybrid corn breeding, carried out by the Union for German Hybrid Maize founded by the seed firm Caspersmeyer at Cherbonhof.

The activities of the main station in the individual crops are reported as follows.

Wheat. The production of the many high-quality wheats with improved yielding capacity, hardness, strength of straw and disease resistance is recounted. The present-day breeding programme has roughly the same objectives and makes use of certain modern techniques such as wide crossing, irradiation and chromosome duplication in addition to the old established methods. Among the spring wheats produced, special reference is made to M1, a hybrid involving Koga, Lichtis früh and *Triticum carthlicum* in its parentage, which combines good yield, excellent baking quality and resistance to 5 races of mildew. Hybrids with American rust-resistant spring wheats have all proved inferior in yield and extensive back crossing to the local wheats has been

undertaken. Freedom from sprouting in the ear is now being incorporated in the hybrids. Resistance to mildew and black stem rust has been observed in some of the wheat x rye hybrids.

Oats. Particular attention has been paid throughout to resistance to frit fly, combined with high yield, full, white grain and resistance to rusts. Yields of spring oats have increased by over 47% since 1903. Winter oat breeding has been given up, since no suitable varieties were ever produced.

Rye. No improvements were achieved in rye by inbreeding and sib crossing, which were given up in favour of family crossing, and later Roemer's method of halves. Experiments are now in progress to test the possibility of making synthetic varieties by crossing inbred lines. Two lines bred independently for short straw, one at Weihenstephan and one at Halle/S., were planted in alternate rows and from their progeny a very good line with short straw and excellent standing capacity, lacking any signs of inbreeding depression, has been obtained. The average grain yield increased by over 49% between the years 1903 and 1951 and the variation from year to year has diminished.

Barley. Inheritance studies have shown that protein content, grain size and germination capacity are heritable characters and desired combinations of them can be produced by crossing. Among the achievements of the institute there appear the creation of famous spring barleys such as Lichtis DN, and Astra, and Akermanns Isaria and Donaria; the breeding of spring barleys combining resistance to mildew and yellow rust with low protein content, good malting quality and partial resistance to brown rust; a much greater uniformity in the barleys now under cultivation, all of which are of the *nulans* type, together with a reduction in the number of varieties being grown; and the breeding of winter barleys combining resistance to mildew, yellow and brown rust, extremely high yield and good standing capacity. An increase in the amount of mildew race A_x has affected the reaction of some varieties previously classed as immune, but Ragusa remains resistant.

Breeding work has been started again with two-rowed winter barleys, which have a lower protein content than spring barleys. Polyploid barleys have been obtained by colchicine treatment.

Forage grasses. All the local pasture grasses have been subjected to a process of selection by

collection of material from established pastures and vegetative multiplication of the most promising. Valuable forms have been created by crossing *Lolium perenne* x *L. italicum*, the hybrids being more productive than the German strains; the reciprocals of the same crosses were distinguished by winter hardiness. No correlation could be established between the fluorescent properties of the roots and either productivity or winter hardiness. Yield increases of over 25% have been obtained in some grasses by crossing of inbred lines.

Legumes and other forage species. Selections from a local land variety of field bean have thrived better than any introduced varieties; an example of these selections is Herz Freya, with a 1000 seed weight of 400–450 gm.; all selections with medium seed size have done better than large or small-seeded forms.

Several high-yielding varieties have been produced from crosses between *Vicia Faba* var. *minor* and var. *major*. Differences of up to 4.6 c. per ha. have been observed in the yields from samples of the same variety of varying provenance.

Promising field pea selections have been made from material from Sikkim as well as from local material and from crosses between field and garden peas. Crossing between winter-hardy peas has led to the production of Späth's Weihestephan winter pea and some alternative varieties. Viktoria garden pea has been crossed with a small-seeded Hungarian pea to produce early peas with low cultural requirements.

Local strains of vetch (*Vicia sativa*) have proved superior to those from elsewhere. For breeding winter vetches *V. villosa* and *V. pannonica* have been employed, and a selection of the latter species distinguished by good and regular seed production, early and abundant hay yields and soft testa, known as Toerring pannonica, is described.

Several soya bean varieties suitable for cultivation in Germany have been bred, some of them being resistant to the soya bean virus.

Every year 60 to 80 thousand red clover seedlings are infected with clover rot and in this way a marked increase in resistance has been achieved, especially in the purple-seeded strains, which also show greater persistency in yield from year to year. Other clover species are also undergoing breeding operations and hybrids of *Medicago sativa* x *M. falcata* have exceeded established lucerne types in hay and seed yield; they germinate somewhat later and so escape spring frosts.

Valuable forms of *Phacelia tanacetifolia* giving

high yields of fodder in dry areas have been bred.

Potato. The first wart-resistant variety produced by the institute was Columba, which exceeded Wohltmann and Parnassia in yield by 19 and 8% respectively. Iris II, which possessed a certain amount of blight resistance, equalled it in yield but was susceptible to wart. The variety Tiger exceeded Parnassia by 33% in starch yield. Every year 60,000 seedlings derived from crosses with Müller's W races have been tested for blight resistance, from which a series of blight resisters such as Robusta, Falke, Monika and Roswitha, were created. All have outyielded Parnassia, and Falke, which is also scab resistant, contains up to 26% of starch in its tubers. High yield, early maturity, good cooking quality and considerable resistance to degeneration are features of the table varieties Jakobi and Suevia, and the varieties Maritta and Benedikta combine good yield, starch content, resistance to degeneration and blight with earliness and keeping quality.

Several wild species have been intercrossed in the attempt to derive material resistant to the new blight biotypes, and *Solanum demissum* with *S. chacoense* for resistance to Colorado beetle.

Fibre plants. Improved selections of flax and hemp are mentioned.

Oil crops. The Niederbarnbach winter rape is a selection distinguished by very early flowering, low stature, strong branching and good yield on poor soils. Selection for early ripening, seed yield and oil content in Cubja winter rape led to the production of a summer rape named Janetzki's Weihestephaner. Early-maturing poppy selections distinguished by freedom from shedding and lodging and by high yield of blue seed are referred to, together with improved selections of white mustard, black mustard, linseed and dual-purpose flax.

2466 Vorträge der 6. Hochschultagung der Landwirtschaftlichen Fakultät der Universität Bonn-Poppelsdorf von 15.-17. September 1952. (Lectures at the 6th Conference of the Agricultural Faculty of the University, Bonn-Poppelsdorf, on 15-17 September 1952).

Bonn 1952 : Pp. 255.

The lectures delivered included the following.

Rudolf, W. Was bedeuten die Wildarten unserer Kulturpflanzen in der neuzeitlichen Pflanzenzüchtung? (What importance have the wild forms of our

cultivated plants in modern plant breeding?). (pp. 185-209).

The role of polyploidy and hybridization in the origin of cultivated plants is exemplified by the garden plum and bread wheat, and the production of synthetic rape. The introduction of resistance genes from wild species is illustrated by the work of the author's institute at Voldagsen in Germany, where mildew-resistant barleys and wheats have been produced from crosses of *Hordeum spontaneum* var. *nigrum* and *Triticum persicum*. Some selections from crosses of *T. Timopheevi* possess combined resistance to mildew and yellow and brown rust, a combination also found in some of the hybrids of wheat with *Agropyron intermedium*, though their yielding capacity is only about half that of the best bread wheat varieties. Reference is made also to a garden bean which possesses many wild characteristics but is being used in breeding because of its resistance to *Phytophthora medicaginis* var. *phaseolicola* and mosaic virus 1. Data are given showing those potato species which in recent tests at the Voldagsen institute have displayed resistance to *Phytophthora*, viruses X, Y, A and leaf roll, Colorado beetle and nematode; resistance to nematode is indicated for *Solanum andigenum*, *S. suaveolens* and *S. Verneti*, and crosses have been made with all these species. *S. andigenum* is also being used to introduce a form of resistance to all known biotypes of late blight which depends on delayed incubation. Hybrids of *S. acaule* immune to virus X have been crossed with hybrids of *S. Antipoviczii* immune to viruses Y and A, and a commercial variety, Fortuna, has already been produced which is resistant to X and A; resistance to leaf roll is present in clones raised from crosses of *S. acaule*, *S. andigenum* and *S. demissum*. Hybrids involving *S. chacoense* and *S. demissum* and possessing resistance to Colorado beetle and half the yielding ability of commercial varieties are available as breeding material.

Pielen, L. *Saatguterzeugung, Saatenanerkennung und Sortenversuchswesen in ihrer Auswirkung auf die Landeskultur. (Seed production, seed certification and the system of variety testing in their effect on general cultivation).* (pp. 210-25).

In the section on variety testing, figures are presented which show that the yields from the three best wheats are some 10% higher than the average wheat yields, and the standard variety Carsten V, which up to 1937 was one of the highest yielding wheats, is now inferior to

the majority of varieties grown. The situation for other cereals is roughly similar; in potatoes on the other hand improvements have been effected in length of growing season, disease resistance, quality and tuber form but the yields remain roughly the same as in the last century.

2467 PAKUDIN, Z.

(At the Krasnodar State Breeding Station).

Kolhoznoe Proizvodstvo (Collective Farming) 1953 : No. 4 : 53-56. [Russian].

Wheat. New varieties, developed at Krasnodar, include the winter wheats Skorospelka L-1 Ulučennaja [Improved Early L-1], which is earlier and more productive than Novo-Ukrainka 83 and possesses resistance to lodging and rust; Novo-Ukrainka 84 which yields more grain and has better baking and milling properties than its predecessor; and Bezostaja Rannaja [Early Awnless], a hardy variety, interesting for its sturdy straw, good grain quality and high yield. The latter is still under trial.

Maize. A productive new variety Krasnodar 4 and a hybrid population, Krasnodar 1/49, are mentioned. The hybrid population yields 6-10 c. more per ha. than the standard maize and conserves heterosis for three generations.

Cicer. Krasnodar 3 and Krasnodar 4, noted for high yield and resistance to *Ascochyta*, have reached the trial stage.

2468 PEIVE, J. [PEIVE, JA.]

(A report on scientific research in agriculture at the Academy of Sciences of the Latvian SSR for 1951).

Latv. PSR Zinātnu Akad. Vēstis 1952 : 3 (56) : 69-92. [Russian].

Breeding of various economic plants, including cereals and potatoes, rubber-bearing *Taraxacum* plants, fruits, nuts and onions in Latvia is referred to. The winter wheat Kursas was improved at the Institute of Soil Science and Agriculture; it has a long ear and shows resistance to lodging. The productive and hardy varieties of lucerne, Pēterlauku 2, Peterlaukskaja Sinjaja Gibrīdnaja [Pēterlauku Blue Hybrid] and Peterlaukskaja Želtaja Gibrīdnaja [Pēterlauku Yellow Hybrid] were developed at the Pēterlauku Research Station.

2469 SARKIRJANOV, S. Š.

(The twentieth anniversary of the Kamalino State Breeding Station).

Selekcija i Semenovodstvo (Breeding & Seed Growing) 1952 : No. 11 : 37-40. [Russian].

A brief account of breeding research with

cereals, grasses, legumes, poppy and mustard is given. Several varieties of cereals and forage plants, which have been made standards, are listed. Reference is made to 17 other varieties of economic plants, which are still under trial.

2470 **(Let the level of plant breeding and seed growing be raised).**

Selekcija i Semenovodstvo (Breeding & Seed Growing) 1953 : No. 1 : 3-9. [Russian].

The text of this editorial article is inspired by those resolutions of the 19th Congress of the Communist Party which relate to the progress expected from agriculture and plant breeding in the USSR during the fifth five-year plan of 1951-55.

2471 VEKSLER, A. I.

(Soviet subtropics).

Priroda (Nature) 1952 : No. 9 : 81-92. [Russian].

Breeding research with bamboo, sweet potato, tea, tung, avocado and several other subtropical plants, besides those listed below, is mentioned.

Citrus fruits. Varieties of lemons developed in recent years include the productive, early and large-fruited Udarnik [Shock-worker] and Novogruzinskii [New Georgian], noted for hardiness, and Suhumskii [Suhumi], characterized by early bearing. Of the new oranges, Pervenec [First-born] is interesting for its productiveness and hardiness, and oranges 63 and 64 for good fruit quality. Mention is also made of new early varieties of grapefruit and mandarin, which produce fruits with a high sugar content.

Feijoa. The hardy early varieties Nikitskii Aromatnyi [Aromatic Nikita] and Krymskii Ranni [Early Crimean] have been developed.

Persimmon. The productive varieties Prevoshodnyi [Excellent], XX Vek [20th Century] and Fujiu show resistance to wind damage and bear fruits with good keeping properties.

Eucalyptus. New forms selected for hardiness and other economic properties include Gigant-skii [Giant], Goluboi [Pale-blue], Pepeljnyi Krupnoplodnyi [Large-fruited Ashen], Pepeljnyi Ravnolistnyi [Even-leaved Ashen] and Pepeljnyi Mjagkii [Soft Ashen].

2472 TAINIO, A.

Keski-Pohjanmaan kiinteillä koekentillä suoritettujen lajikekokeiden tuloksia. (Some results of varietal experiments performed at the permanent experimental field for mid-Pohjanmaa).

Koetoiminta ja Käytäntö 1952 : 9 : No. 12 : p. 4.

Spring wheat. Experiments with spring wheat show the superiority of Apu [Aid] for earliness and heaviness of yield.

Oats. Behaviour and relative yields of a number of varieties are discussed. Simo is shown to be the most heavily yielding in this part of Finland, but is suitable only as a fodder crop.

Rye. Experiments over a number of years with several varieties have established the suitability of Sangaste for cultivation in central Pohjanmaa.

Barley. The superiority of the late varieties Binder and Balder has become apparent, although the early variety Vega is successful on comparatively acid soils.

Potatoes. Trials have demonstrated the high yielding capacity of Eigenheimer which has also a good starch content and keeping qualities.

2473 Lijst van veldproeven, proefnemingen en proef- en voorbeeldbedrijven van rijkslandbouwconsulenten en andere instanties 1952. (List of field trials, tests and experimental and model farms of national agricultural advisors and other authorities, 1952). Meded. LandbVoorlDienst 1952 : Pp. 100.

Among the tabulated data composing this report is a 4-page list of new varieties of cereals (including maize), peas, beans, linseed, flax, poppy and potatoes tested in the Netherlands in 1952 and not included in the list of approved varieties for that year (cf. p. 164 above).

2474 Verslag over de Landbouw in Nederland over 1951. (Report on Agriculture in the Netherlands for 1951).

Versl. Dir. Landb., 's-Grav. 1952 : No. 1 : Pp. 388.

Rye. By selection within strains and strain crossing the fertility of tetraploid Petkus rye, bred in 1946, has been considerably increased. Tetraploids of many other rye varieties have been bred with a view to crossing them *inter se* to obtain a good tetraploid variety.

At the Central Institute for Nutrition, Wageningen, tetraploid rye, as compared with diploid varieties, showed a high protein content, good baking quality and a low enzyme content, a characteristic which may indicate marked resistance to germination in the ear.

Maize. New inbred strains were crossed to determine their combining ability. In tests of experimental hybrids two out of 30 were superior in yield and economic characters.

Forage grasses. Some clones of perennial ryegrass and timothy obtained by large-scale crossing seem superior to the Dutch commercial varieties in yield and resistance to cold and rust. New breeding material of cocksfoot, perennial ryegrass, timothy, red fescue and meadow fescue has been collected from grasslands in the Netherlands. The Wageningen Genetics Laboratory undertook a study of the polyploid forms of species of *Festuca*, *Agrostis* and *Poa* and the Plant Breeding Foundation is working on the breeding of tetraploid Italian ryegrass.

Lupin. Some strains, bred by the Plant Breeding Foundation, have shown much faster growth in the early stage of development and may be included in the Variety Register. Forms resistant to wilt have been used in crosses, and 1952 should see the first resistant forage lupin for practical use.

Root crops. Tetraploid seed of races of mangels has been obtained.

Potatoes. Parent plants for breeding industrial potatoes were sought. Work on resistance to leaf roll and virus X was continued. It is proving difficult to improve the tuber shape in hybrids completely resistant to Colorado beetle. The Genetics Laboratory of the Agricultural College has been studying *Solanum* species and hybrids with twice the normal chromosome number, especially with reference to their fertility and cytology.

The serological indications that certain aberrant plants of Bintje and "healthy" Industrie contained a virus were confirmed experimentally and it seems possible that a new virus is concerned. Inactivation of the leaf roll virus was brought about by keeping infected tubers in a thermostat for 3-5 weeks at about 37°C; in material so treated various mutations occurred.

Flax. A laboratory test and a selection technique for use in breeding for rust and scorch resistance in flax have been worked out. The new variety Wiera surpassed other good varieties by 5% in yield of lint and straw.

Forestry. An elm that is resistant to elm disease and also adapted to conditions in the Netherlands has been acquired through the agency of the Institute for Applied Biological Research in Nature.

The Institute for Forestry Research made a survey of pine woods in the Netherlands and of individual trees suitable as sources of seed. Experimental plots of Douglas fir of various provenance showed marked differences in yield.

2475 Verslag over de landbouw in Nederland over 1950. (**Report on agriculture in the Netherlands for 1950**).

Versl. Dir. Landb., 's-Grav. 1951 : No. 3 : Pp. 390.

Maize. At the Institute for Plant Breeding numerous inbred lines were top-crossed to determine their combining ability. Some promising inbreds were systematically intercrossed and about 30 double crosses were made. Early-ripening forms that developed well in spring were selected. In hybridization work an attempt was made to replace one of the four inbred lines in well-known American double crosses by a different strain to obtain a type more suitable to conditions in the Netherlands. Breeding material was supplied by Canada, USA, Italy and France.

Lupin. By breeding, the yield of green matter and seed has been increased and plants with indehiscent pods and better early development were obtained. Improvements as regards protein and alkaloid content were also achieved. A method of alkaloid determination for use in practice was investigated.

Valuable breeding material was obtained from crosses with bitter lupins, as well as mutant forms following X-ray irradiation. The problem of suitable strains of root nodule bacteria was studied.

Beet. Induction of tetraploids and research on vernalization and on the induction of tetraploidy was undertaken and a study of yields from first crosses of more or less inbred strains was carried out.

Potato. A breeding programme was initiated to obtain varieties resistant to *Phytophthora infestans*, wart, Colorado beetle, night frost, eelworm and degeneration, *Fusarium* and other diseases including virus infections. Wild and more or less cultivated species and varieties of *Solanum* are being used in the search for resistant material (cf. Absts. 467 and 468). Some plants apparently resistant to the four

known strains of *Phytophthora* have been found and are being analysed as regards other characteristics in numerous hybrid combinations. An extensive series of crosses, in many cases with varieties that normally set no berries, was effected by grafting on tomato and removal of the tubers.

Horticultural crops. In the improvement and breeding of nut trees, the emphasis has been on varietal studies and methods of multiplication. Other problems investigated at the Institute for Breeding Horticultural Crops have been: breeding apples for scab resistance and cucumbers for mosaic resistance; and the production of male homozygous asparagus plants.

In view of the importance of yield and quality in the breeding of herbs, the relevant research has now been placed under the control of the Institute for the Breeding of Horticultural Crops (cf. Abst. 2142).

2476 LAROSE, E.

Résultats des principaux essais effectués de 1947 à 1951 à la Station de Recherches de l'État, pour l'Amélioration des Plantes de Grande Culture à Gembloux. (**Results of the main trials carried out from 1947 to 1951 at the National Research Station for the Breeding of Crop Plants at Gembloux.**)

Centre Rech. Agron., Gembloux 1951 : Pp. 97. (Mimeographed), also Rev. Agric., Brux. 1952 : 5 : 1187-1239.

Moës, A. *Essais sur orges d'hiver*. (*Experiments on winter barleys*). (pp. 3-14).

Bordia (line 456), bred at the Gembloux Station from line 66 de Gembloux x Professeur Damseaux (1924-37), gave a very high yield, had stiff straw and showed good resistance to fungous diseases and frost.

The new late ripening, winter barley Urania is high yielding but deficient in resistance to lodging.

Vogel's Agaer is very frost resistant and gives a good yield.

Noulard, L. *Essais sur froments d'hiver*. (*Experiments on winter wheats*). (pp. 24-38).

Among the varieties included in these trials the highest yielding, Ministre [Minister], proved completely resistant to rust in 1950-51, while Blédor showed good resistance to lodging. Prima, Bellevue and Directeur Journée were superior to Jubilé, Ministre and Alba in cold

resistance. The new variety Cappelle did well but needs further investigation.

Noulard, L. *Essais sur froments de printemps*. (*Experiments on spring wheats*). (pp. 39-44).

Though up to the present none of the registered varieties are resistant enough to lodging when grown in good soils, the new line H 315 P, now called Alf, represents a definite advance in this respect and also shows adequate resistance to rusts.

The lines H 315 O, H 325 M and H 325 N are promising as regards yield and resistance to lodging.

Lacroix, L. *Essais sur lin*. (*Experiments on flax*). (pp. 57-77).

Some 30 varieties of fibre flax were tested in trials in which the experimental conditions varied each year and the results are shown in tabular form. Arc-en-Ciel [Rainbow], a new variety bred at the Gembloux Station, is noted as being highly resistant to lodging and showing good resistance to diseases. It gave much seed and a high yield of scutched fibre producing tow of good quality.

Cantillon, P. *Essais sur tabac*. (*Experiments on tobacco*). (pp. 78-89).

Two series of comparative trials were carried out (a) on the F₂ generation of the new hybrid lines Broyard x Lignée 06, Kentucky x Lignée 06 and the F₁ of Phillipin x Lignée 06; and (b) on varieties of *Nicotiana Tabacum* and *N. rustica* to identify any of value for large-scale nicotine production. Series (a) proved inconclusive; series (b) showed that the choice of the proper variety is all important for this project and that the study of types of *N. rustica* should be continued.

Moës, A. *Essais sur féveroles* (*Vicia faba* L.). [*Experiments on horse beans* (*V. faba* L.)]. (pp. 90-93).

In combined tests of varieties and density of sowing Niki proved the best commercial variety available. The Gembloux Plant Breeding Station has isolated two small-seeded types called Station Hybrid 26.1.1 and 26.1.4, from the local races. Their yield is about equal to that of Niki, 2965 kg. per ha.

2477 Rapport d'activité 1951. (**Report on work, 1951**).

Landw. Jb. Schweiz 1952 : 1 : 916-1041. In addition to comparative trials of Swiss and other varieties of bread cereals, maize, forage legumes, grasses and cabbage, potatoes, sugar

beet, rape and vines, the following research was also conducted by the Swiss Federal Experiment Stations.

Cereals. Genetic and cytological studies and hybridization operations are carried out at Mont-Calme Station, Lausanne, while the Oerlikon Station is concerned with problems of resistance to diseases and pests and with the testing and selection of progenies from hybrids from Lausanne.

The following interspecific and intergeneric crosses are being made: (1) the indigenous autumn wheats Probus, MC 245 and MC 268 with *Triticum Timopheevi* and *T. persicum*, with varieties of rye, with *Agropyron intermedium*, and *A. elongatum*, and with hybrids of *Agropyron* x *T. vulgare*; (2) *Aegilops squarrosa* with *T. dicoccoides* and *T. dicoccum* to obtain forms of the spelt group; and (3) between different types of *Triticale inter se*.

Material for a morphological and physiological study of wheat varieties bred at Mont-Calme comprises 30 samples of different provenance of MC 245, 25 of MC 268, 3 of MC XXII and one of the old wheat Barbu du Tronchet.

Cytological studies of rye and barley include: (a) the production of tetraploids of the indigenous ryes Rothenbrunnen, Witzwil, Fellers and Berna; (b) investigations on the fertility of tetraploid Petkus rye, and (c) the breeding of tetraploid forms of the barleys Riniken, Kenia and Freja and a study of a tetraploid Isaria.

Forage plants. Red clover breeding for high yield in two successive years and resistance to *Sclerotinia Trifoliorum* and nematodes is being combined with a study of indigenous ecotypes. Examination of the sainfoin collection suggests that a variety might be obtained that is highly productive during the whole vegetation period. Quality and nematode resistance also receive attention. Breeding of ryegrass, meadow fescue and cocksfoot is proceeding, persistence, quality and resistance to diseases and pests being among the objectives.

Tobacco. At Mont-Calme, the F₃ from Mont-Calme Jaune [Mont-Calme Yellow] x Ambalema is undergoing selection for resistance to mosaic. Earliness and disease resistance are among the criteria in selection from the F₆ and F₇ obtained by back crossing the hybrid Mont-Calme brun x Mont-Calme jaune to each parent.

2478 MANOLOV, I.

(In Mičurin's footsteps).

Priroda (Nature) 1953 : No. 4 : 77-78.
[Russian].

Two high-yielding cotton varieties with large

bolts, long lint and high ginning outturn, three drought-resistant varieties of *Triticum durum*, others with improved standing capacity, and early-maturing, drought-resistant yellow dent maize varieties are named among the achievements resulting from the application of Soviet methods of breeding in Bulgaria.

2479 SUNAGA, S.

(The significance of varieties in Japanese agriculture).

Nogaku Kenkyusho Iho/Bull. Inst. Agric. Res., Tohoku Univ. 1950 : 2 : 235-52.
[Japanese].

The economic results of plant breeding in Japan are considered, with special emphasis on the improvement of rice.

2480 Annual Report of the Indian Council of Agricultural Research for 1950-51 : Pp. 170.

Wheat. Progenies of numerous crosses, made to combine desirable agronomic characters with resistance to black, brown and yellow rusts, are undergoing initial selection at Agra, Delhi, Pusa and Simla. In Madhya Pradesh, selections from the F₆ and F₇ of crosses between local strains have bred true for resistance to black rust. An early maturing durum wheat from Canada showed a high degree of resistance at Mahabeshwar and has been crossed with local rust-susceptible durum strains. Hybrids from Madhya Pradesh which proved resistant to stem rust in Bombay are listed.

Maize. Details are given of the progress of testing the adaptability of American hybrids, of selecting and inbreeding desirable local varieties and assessing the combining ability of inbreds by top-crossing at the Indian Agricultural Research Institute and stations in the Punjab. At Jullundur, Nagrota and Kulu, many of the single and double crosses attempted have significantly outyielded local open-pollinated varieties. Since two crops mature successfully in one year at Nagrota, the synthesis of hybrid maize can be accelerated by effecting both single and double crosses between inbreds whose performance in top crosses has been determined in the same year.

Barley. A scheme for selection among variable local strains in Rajasthan has been sanctioned.

Millets and sorghum. Two F₁ hybrids of *Pennisetum typhoideum*, X 1 and X 2, have outyielded other strains by 29-39% in Madras; seed is being increased. The performance of improved selections of *Panicum miliaceum*,

Panicum miliare and *Echinochloa frumentacea* in Mysore and of *Panicum Crus-galli* and *Paspalum scrobiculatum* in Uttar Pradesh is discussed. A survey of the reaction of local strains of *Sorghum vulgare* to *Striga* is being carried out in Madras, prior to breeding for resistance.

Rice. Seven breeding projects were in operation, including two new schemes for hybridization between *indica* and *japonica* rices and for development of varieties suitable for the temperate areas of the Assam hills. Chinese varieties outyielded imported and indigenous rices in Kashmir by 60%; seed has been multiplied for local distribution and trials in other regions. Details of the performance of many improved selections in Karia, Surat and Hyderabad are also included. Resistance to foot rot and blast is being studied in Bengal and Madras. A few early maturing hybrids with a high degree of blast resistance have been selected for further trial in Madras.

Clove. With a view to future breeding, a collection of strains from different regions of Travancore and yield analyses of trees in various localities are being undertaken.

Chilli. In Madras some 30 plants were selected for thrips resistance from bulk trials of nine varieties equalling GI in respect of fruit length and girth, strength of calyx attachment and pungency.

Turmeric. Saraganda gave significantly higher yields than all other varieties on trial in Orissa.

Fruits. Varieties of apple, pear, plum, citrus, custard apple, mango, litchi, papaya, banana and grape suitable for particular parts of different states are listed. At Poona, the following chromosome numbers have been determined for subgenera of *Musa*: *Physocaulis*, $2n = 18$; *Rhodochlamys*, $2n = 22$ or $22 + 1$; and two series of *Eumusa* with $2n = 22$ or $22 + 1$ and 33 or $33 + 1$. Attempts to improve cultivated bananas, by breeding for new genomic combinations, are reported from Calcutta University.

Pulses. Varietal improvement of black gram (*Phaseolus Mungo*) and green gram (*Ph. aureus*) is reported from numerous states. At Annamalai University, the interspecific hybrid *Ph. radiatus* x *Ph. Mungo* was found to combine characters of both parents, growing vigorously and producing luxuriant foliage and high seed yield. The number of beans per pod has increased from 4 in the F_2 to 12 in the F_7 . Strains of *Dolichos biflorus* giving high yields

have been developed in Madras, Mysore, Hyderabad and Orissa.

On the basis of results of yield trials, varieties of soya bean are recommended for Mysore, Uttar Pradesh and the Punjab. A large-seeded yellow type, Punjab I, capable of yielding 2790 lb. beans per acre, is being distributed to growers on both hilly tracts and plains in the Punjab; the chief merit of this new variety is the absence of the nutty flavour usually associated with soya beans.

High yielding table strains of *Pisum sativum* have been selected for trial in Uttar Pradesh and Bihar.

Breeding to improve yield and resistance to drought and wilt of *Cicer arietinum* is in progress in many states. A high degree of resistance to wilt has been shown by two selections, Chafa Tr.-1-1-4-5-11 and Dohad 206-8-1-3-6-1-2, in Bombay; both have outyielded the improved Dharwar 18-12.

At the Presidency College, Calcutta, flowering of Barisal Lentil and Lentil Hyb. 1 occurred 29 and 33 days earlier than controls, respectively, after vernalization at 2-4°C for 30 days, followed by exposure to 16 hr. photoperiods; foliage and seed yields of both varieties were increased. In Lentil 5, however, flowering was delayed by similar treatment and yields were lower than in controls.

Varieties of red gram (*Cajanus Cajan*), showing improvements in yield, cooking quality and resistance to wilt and drought, are recommended for further trial in seven states. In Bihar a high incidence of phyllody and consequent sterility has caused 40% yield reductions; late maturing strains with erect growth are most resistant.

Coriander. None of the strains collected from various parts of India showed immunity from wilt (*Fusarium oxysporum*) in Madhya Bharat; the local variety had a lower wilting percentage than those from other states.

2481 **Annual Report of the East African Agriculture and Forestry Research Organisation for 1952** : Pp. 101.

Maize. A study is being made of the technique involved in the production of relatively stable, heterozygous populations for use in native reserves. A programme of testing introductions for resistance to rust (*Puccinia polysora*) and of breeding for resistance has been planned.

Cassava. Breeding for virus resistant varieties continued. Resistant interspecific hybrids and back crosses of these to cassava have shown

promise in trials in the different regions of East Africa.

Groundnut. Diploid *Arachis* spp. and varieties are being studied for their breeding value. A small amount of seed has been obtained from crosses of the cultivated groundnut with *A. Diogoi*, a species resistant to rosette virus and *Cercospora* leaf spot. An attempt has also been made to cross the cultivated form with *A. prostrata*. *A. Diogoi*, *A. prostrata* and *A. glabrata* are being treated with colchicine to obtain tetraploids and thus facilitate hybridization. Intervarietal crossing of groundnut has also been carried out.

2482 Annual Report on the Agricultural Department, Nigeria, for the year 1950-51 (1953) : Pp. 123.

Cereals. Some maize hybrids introduced from the United States have given a promising performance in a trial in the Northern Provinces. Crosses have been made to introduce the dwarf habit of a local sorghum into the more popular white-grained farfara type. Combine sorghums from the United States have also been used in hybridization. The possibility of selecting sorghum for *Striga* resistance is being explored. A high yielding millet strain maturing in less than 76 days is being developed. Local and introduced varieties of upland rice are under observation.

Cotton. Breeding and selection is reported (cf. *PBA*, Vol. XXII, Abst. 2836).

Cassava. In a trial in the Northern Provinces, yield reduction due to mosaic infection was only slight. Concentration upon high yielding capacity, rather than resistance to mosaic, therefore appears preferable in breeding.

Cacao. Nigerian T 38, selected on account of its high yield and large beans, has the defect of being slow to come into production. Better selections are therefore being sought, the high yields of hybrids between T38 and Trinidad selections being of particular interest.

Kola. Recording yields of individual trees has been initiated at Agege, Western Provinces. At Ibadan, observations on the frequencies of male and female flowers were continued. Study of the inheritance of cotyledon colour was resumed.

Sesame. Selection for high yielding, early maturing strains continued. Strains from Venezuela and Trinidad are under test, special attention being given to the single-stemmed types which ripen more uniformly.

Oil palm. Crossing continued at the Oil Palm Research Station, near Benin. A collection of palms other than *Elaeis guineensis* is being established for breeding and cytological purposes.

Groundnut. The new strain Kano 50 is to be distributed in the Northern Provinces.

2483 Annual Report of the Department of Agriculture, Nyasaland Protectorate for the year 1951 (1953) : Pt. II : Pp. 40.

Maize. Hybrids from Southern Rhodesia out-yielded open-pollinated varieties and local maize in trials. In the hybrids the cobs are not well covered, however, and the grain is soft, so that severe weevil infestation occurs during storage. In work on the production of local hybrids, self pollination of stocks from different areas of the country continued.

Cotton. Selection and hybridization are reported (cf. *PBA*, Vol. XXII, Abst. 2836).

Tung. The superiority of budded trees over seedlings with respect to yield was again confirmed. In trials of clones planted during 1940/1941, the B types 10 and 14 and A types M 8 and M 13 again produced the highest yields and are recommended.

2484 Annual Report of the Director, Experimental Farms Service, Department of Agriculture, Ottawa, Canada for 1951-1952 : Pp. 31.

This report deals briefly with breeding work on cereals, forage plants, potato, flax, tobacco, linseed, apple, strawberry, melon, tomato and beans (cf. Abst. 991).

2485 Investigación técnica abriendo nuevos horizontes en la agricultura de Guatemala. / Experimental investigations opening up new horizons for agriculture in Guatemala.

Inform. Activ. Inst. Agropec. Nac. 1 July 1951 to 30 June 1952 : Pp. 97. (Mimeographed).

Wheat. Varieties and advanced hybrid lines were tested. At Labor di Ovalle, Kentana 48 again gave an outstandingly good performance, showing superiority over the control Supremo 211 in yield, shortness of straw and resistance to lodging. Kentana 48 is to be increased and distributed. In Tecpán, lines from (Pelón Colorado x Renown) x (Renown x Supremo) and Newthatch x Marroquín were particularly promising.

Maize. Collection of Guatemalan types has been initiated, as part of the international programme of maize collection in Latin American countries.

Rice. Testing of varieties and selections has been extended to the Santa Rosa region.

Coffee. Further selfing and crossing of species and varieties was effected. The Cooperative programme for the selection of high-yielding trees by means of individual tree records throughout Guatemala continued.

Beans. Single plant selections for disease resistance have been obtained from local and introduced lines. Marked variation between 24 lines with respect to the content of certain essential aminoacids suggests that improvement in nutritive value is possible.

2486 Annual Report on the Agricultural Department, St. Vincent, 1951 (1953) : Pp. 46.

Maize. Crosses between the local variety and the Jamaican hybrid JSY gave higher yields than the former parent.

Cotton. Breeding is reported (cf. *PBA*, Vol. XXII, Abst. 2836).

2487 Investigations 1950-1951.

Bull. Dep. Agric. Jamaica 1951 : No. 49 : Pp. 153.

In addition to many varietal trials of cereal and other crops, the following work is reported:—

Coffee. Individual tree recording continued.

Cashew. Work on the selection of desirable types is in progress.

Banana. Among the new varieties tested, seedling 1877 shows most promise; it is being compared with Lacatan for fruiting qualities and resistance to leaf spot.

2488 BØGH, H.

Planteforædling i U.S.A. Rapport fra en studierejse i U.S.A. sommeren 1951. (Plant breeding in the USA. Report of a study tour in the USA in summer 1951).

Udenrigsministeriets Foranstaltning, København 1952 : Pp. 79.

In this report on a tour carried out under the Marshall Aid Plan, the following aspects of plant improvement in the USA are described: organization and methods; the collection of plant material from other parts of the world; evaluation of material undergoing selection; breeding for resistance; the extent to which various breeding techniques are applied; the breeding

of individual crops; and seed production of varieties and strains.

In conclusion, the possible applications of the author's findings to Danish plant breeding are considered.

2489 Report on the Agricultural Experiment Stations, 1952.

U.S. Dep. Agric., Wash. 1953 : Pp. 150.

The report includes a survey of new varieties of cereal and other crops recently developed in the United States. Most of the numerous varieties described have already been referred to in *Plant Breeding Abstracts*.

2490 KOBLET, R.

Fortschritte im Pflanzenbau. Ergebnisse einer Studienreise in die Vereinigten Staaten von Amerika. (Progress in plant cultivation. Results of a study tour in the USA).

Schweiz. landw. Mh. 1953 : 31 : 37-63.

In the section on plant breeding reference is made to experiments on the use of hybrid vigour in breeding clovers and forage grasses, the large scale on which breeding for pest and disease resistance is being carried out, and to the high degree of cooperation that exists between workers in different branches and in different localities.

2491 Sixty-fifth Annual Report of the New York State College of Agriculture at Cornell University, Ithaca, New York, and of the Cornell University Agricultural Experiment Station for 1952 : Pp. 117.

Cereals. In the report of extension activities, mention is made of the following recently released varieties: the wheat Genesee (cf. *PBA*, Vol. XXII, Abst. 289); the oat Craig (cf. *PBA*, Vol. XXII, Abst. 313); and the maize hybrids Cornell M-1 and M-4, which are expected to increase grain and silage yields by 8-10%.

2492 Seventy-first Annual Report of the New York State Agricultural Experiment Station, Geneva, N.Y., for 1952 : Pp. 25.

Fruits. Reference is made to the development of four strawberry selections with an ascorbic acid content 25% higher than that of existing varieties; one has been named Eden (cf. Abst. 656). An apple variety suitable for processing has been found to have an ascorbic acid content of 19.5 mg. per 100 grm., i.e. twice the content present in popular varieties. The grape seedlings Himrod, Romulus, Alden, Bath and Naples have been introduced (cf. Abst. 473).

Tomato. The release of Red Top, a variety for paste production, is reported (cf. Abst. 1560 and 1561).

2493 Results of research in 1951. 64th Annual Report of the Director of the University of Kentucky Agricultural Experiment Station 1951 : Pp. 80.

Winter wheat. Selections of Frondoso x Trumbull-Hope-Hussar continued to show good yielding capacity and a high degree of resistance to leaf rust.

Winter barley. The new variety Kenbar was distributed (cf. Abst. 1183).

Forage grasses. Inbred and open-pollinated lines of tall fescue were selected on the basis of their performance in preferential grazing trials. In several cases, F_1 hybrids of ryegrass x tall fescue showed greater vigour than tall fescue, and bore leaves with a softer texture and deeper green colour in early spring. Viable seed has been secured from back crosses of the hybrids to both parents.

Hemp. Breeding has been initiated at the Western Kentucky Substation to develop adapted monocious varieties.

Tobacco. The factor of *Nicotiana longiflora* for resistance to wildfire has been successfully incorporated in a chromosome of *N. Tabacum*. The hybrid between *N. longiflora* and *N. Tabacum* used in breeding for wildfire resistance also possesses resistance to black shank. If the latter factor can be established in an *N. Tabacum* chromosome, the development of varieties combining resistance to the five major diseases should be possible in a relatively short time.

Strawberry. Breeding aims comprise resistance to red core and nematodes, firmness, and improved yield and quality; hybrids involving Temple, Sparkle, Fairland, Fairpeake, Premier, Fairfax, Blakemore, Tennessee Beauty, Tennessee Shipper and Midland are being studied.

2494 LONGWELL, J. H. & SHIRKY, S. B. Serving Missouri agriculture. Annual Report of the Missouri Experiment Station, July 1, 1949-June 30, 1950.

1951 : Bull. No. 556 : Pp. 152.

Wheat. In yield tests of winter wheats at four centres, selections of Clarkan x Vigo gave a good yield and were resistant to leaf rust and loose smut. In nursery tests, selections of Kawvale x Purplestraw-Chinese-Michigan Amber showed the advantages of earliness, stiff straw and resistance to leaf rust and loose smut.

With the aid of nullisomics and monosomics the following chromosomes have been found to be

associated with resistance to one or more races of black stem rust: VI and X of Red Egyptian; XVII of Thatcher; and X of Timstein. Chromosome XI of Axminster possesses a dominant gene for mildew resistance. Plants with resistance to leaf rust resulting from the addition of a pair of *Aegilops umbellulata* chromosomes have been crossed with nullisomics in an attempt to substitute the *Aegilops* chromosomes for known wheat chromosomes.

Spring oats. Mo. 0-200, a disease-resistant variety of the Columbia type, has been released (cf. Abst. 2607). Promising early-maturing strains combining resistance to Victoria blight and race 45 of crown rust have been developed from Columbia x Victoria-Richland and may be released.

Maize. The late-maturing white hybrid US 523 W was released (cf. Abst. 1002). Seed stocks for the late-maturing yellow hybrids, Missouri 800 and 804, were increased; these hybrids have given higher yields than Missouri 8, and shown less stalk lodging. Synthetics composed of lines with resistance to bacterial wilt, ear worm, stalk rots or *Helminthosporium* leaf blight are being developed, as possible sources of inbreds with higher levels of resistance.

Neither mutation of R^r to r^r nor to R^g , affecting seed and plant colour, is dependent upon the occurrence of crossing over between g , situated approximately 15 units to the right of R , and a heterochromatin appendage about 1 unit to the left.

Mutation of r^r : Belt results in an unstable gene r^g , which frequently undergoes somatic reversion to r^r .

Winter barley. A selection of Ky. 5 x Early Beardless has been named Mo. B-400. It is early, hardy, high yielding and moderately resistant to mildew, loose smut and spot blotch. Promising selections have also been obtained from crosses of Admire, Ky. 2 and Michigan Winter with Early Beardless.

Pasture grasses and legumes. Progeny testing of cocksfoot selections continued. Hybrids of *Poa arachnifera* x *P. pratensis* are to be tested in north-western Missouri.

Preliminary results of interstrain hybridization of *Lespedeza stipulacea* are promising. Two strains of *L. striata*, FC 31852 and FC 31057-5, have shown superiority over other lespedezas for use with grass in permanent pastures, and are ready for increase.

One generation of inbreeding greatly reduced vigour in birdsfoot trefoil.

Tomato. Most of the lines with resistance to

wilt (*Fusarium oxysporum* f. *Lycopersici*) derived from *Lycopersicon pimpinellifolium* were completely resistant to this disease in field tests. Race 2 of the fungus is however capable of attacking plants with this type of resistance (cf. *PBA*, Vol. XXI, Abst. 3110). Both races 1 and 2 attack the host only through vascular wounds. Host reaction depends chiefly upon the time elapsing before the initiation of wound-healing processes.

Soya bean. Among the 275 strains tested in one or more localities, those from Chief x (Chief x Macoupin) gave outstandingly good results in central Missouri; selections from Lincoln x Ralsoy continued to show promise in south-eastern Missouri.

Hybrids from many combinations were selected. In breeding for resistance to bacterial pustule, Clemson Nonshatter, whose resistance depends upon a single recessive gene pair, is being used; multiple and back crosses are being employed.

2495 La labor de la Estación Experimental en el año 1952. (**The work of the Experimental Station in 1952**).

Publ. Misc. Estac. Exp. Agríc. Tucumán 1953 : No. 6 : Pp. 50.

An outline is given of the work carried out in the last 42 years by the Tucumán Experimental Station in Argentina. Its achievements include the production of sugar canes resistant to two epidemics, that of mosaic in 1918 and that of smut in 1943, and tomato hybrids and selections resistant to drought and to *Phytophthora*.

2496 Memoria año 1951, Dirección General de Fomento Agrícola. (**Report for 1951 of the Directorate General of Agricultural Encouragement**).

Bol. Prod. Fom. Agríc., B. Aires 1952 : 4 : No. 34 : Pp. 168.

Lists are given of the varieties of cereals, linseed and sunflower inscribed in the official variety register of Argentina; these include 8 new varieties of wheat, 2 of oats, 2 of barley, 1 of linseed and 1 of rye, together with varieties of rice, maize and sunflower previously inscribed provisionally and now confirmed.

Selection and variety trials have continued with sugar cane, tobacco and other plants.

Cotton. The old cotton varieties have been almost entirely replaced by selected varieties, either imported or produced locally, and data are given on their yields of raw cotton and of lint.

Oil plants. Very promising results were obtained from groundnuts selected from heterozygous material furnished by the US

Department of Agriculture, which have out-yielded Blanco de Santa Fe by amounts varying from 35 to 200%. Selection for forage yield and resistance to *Cercospora personata* has resulted in some distinctly superior types of Blanco de Santa Fe and of the US hybrids, one of which is distinguished also by extreme earliness.

Crosses have been made of the early dwarf castor bean 38 from Brazil with Argentine varieties and 155 selections are under trial.

Soya bean races have been selected for earliness and freedom from shedding; the best selections have been obtained from the variety Abura.

Selection work has been carried out with other oil plants including *Carthamus tinctorius*, *Sesamum indicum* and colza.

Peppers. Sweet pepper selections from hybrid populations have distinguished themselves in yield, fruit quality and freedom from disease and have produced as much as 2000 kg. of dry fruits per hectare. Selection work with chillies has been resumed.

2497 Progresos científicos alcanzados durante 1952 por la Dirección General de Investigaciones Agrícolas y sus dependencias técnicas. (**Scientific progress achieved during 1952 by the Department of Agricultural Research and its technological dependencies**).

Idia 1952 : Nos. 59-60 : Pp. 92.

In a general review of progress in agricultural research in Argentina, reference is made to the success of the new Pampa linseed; the flax varieties Mapún 52 MAG and Mocoví MAG, both immune to rust and the latter also resistant to wilt; the high yielding wheat Magia, resistant to lodging; the forage barley Negra Manfredi MAG [Black Manfredi MAG] and new cotton varieties which now supply 50% of the country's needs.

Reports of the individual stations contain the following items.

Centro Nacional de Investigaciones Agropecuarias. (*National Centre for Research in Agriculture and Livestock*). (pp. 3-35).

Wheat. Line 48-1 of L. Cael x 38 MA has proved worthy of release, and good reports have been received of the varieties Magnif Entrerriano and Frontana. Large numbers of varieties have been tested for resistance to loose smut and bunt. Genes for mildew resistance other than those in Axminster and Normandie have been found. Progenies of Magnif G-1-3-3-1 have given rise to some good rust-resistant selections, and some hybrids of

Triticum x Agropyron have displayed resistance to *Puccinia graminis* race 15. Resistance to race 17 has been found in Reliance and genes for resistance to races 11 and 15 in line G.

Several varieties have displayed resistance to *Septoria nodorum* but none to *S. Tritici*.

Oats. Some selections from the cross Tama x Santa Fe possess resistance to all Argentine races of *Puccinia coronata* and almost all of *P. graminis*, and selections from Santa Fe x Klein Mar are resistant to all the *P. coronata* races in Argentina and to lodging.

Rye. Selection has been carried out in Waldstauden and Común Pico ryes and in crosses between them; the hybrids combine earliness with high tillering capacity.

Maize. A dwarf mutant and a mutagenic line have been discovered. The female plant and not the temperature have been found to affect the viability of the microgametophyte. Two generations a year continue to be obtained in selections for high combining ability.

Barley. Some promising hybrids of Osiris x *Hordeum spontaneum* are immune to *Oidium* and resistant to *Rhynchosporium Secalis* and *Puccinia anomala*. A number of varieties resistant to *Rh. Secalis* are mentioned.

Genetic studies of F_3 and back-cross generations of *H. irregulare* x *H. spontaneum* have shown that the *irregulare* character is not allelic with *V*, which determines the number of rows. A chlorotic mutant has been observed and crossed with normal plants.

Some 54 interspecific crosses have been made, together with taxonomic and phytopathological studies on *Hordeum* species.

New genes for mildew resistance have been found in the varieties Palmella Blue and Multan and in a mutant from Trebi. Resistance to net necrosis has been detected in the variety San Carlos. Resistance has been shown to be dominant in hybrids of *H. spontaneum*.

Sorghum. A group of varieties resistant to *Helminthosporium turcicum* has been discovered, and others have proved resistant to *Pseudomonas andropogoni*.

Forage plants. In a study of some 500 clonal selections of *Phalaris arundinacea*, a number of hybrids of *Ph. arundinacea* x *Ph. tuberosa* have been detected, and from them 5 seedlings have been obtained; one of them showed resemblance to *Ph. minor* and probably resulted from pollination with this species. An amphidiploid hybrid of *Ph. tuberosa* x *Ph. arundinacea* has been obtained by colchicine treatment.

Further selection for nematode resistance has been carried out on the M5 mass selection of

lucerne, and selection M1, which is resistant to nematode, has been developed further.

Observations have been made on selections of *Sorghum alnum* in respect of hereditary characters and disease resistance; forms almost free from rhizomes have been selected. Marked superiority in yield and reduced toxicity have been established in a number of selections of Sudan grass.

Sugar cane. Tuc. 2645 and POJ 2878 continue to show resistance to smut.

Beet. A large collection of sugar beets and mangels is under observation and hybridizations have been started between *Beta vulgaris*, *B. patellaris* and *B. maritima*.

Tobacco. Progenies of *Nicotiana Tabacum* x *N. ditagla* have been selfed and back-crossed. A spontaneous allopolyploid of *N. Tabacum* x *N. otophora* segregated in its progeny. Another hybrid of *N. Tabacum* x *Petunia Parodii* (cf. Abst. 1365) has been obtained. Genetic studies of various characters in *N. Tabacum* and *N. alata* are being continued.

Vegetables. Further selection in the White Santa Fe cabbage has improved its earliness and uniformity.

Carrots are being selected for freedom from bolting, tomatoes for hardness, potatoes for blight resistance, French beans for healthiness and yield, and peas for earliness and resistance to frost and *Bruchus*; a number of intervarietal pea crosses are promising.

Selection work is also in progress with cauliflowers, garlic, sweet pepper and a number of other vegetables.

Centro Regional Pampeano de Investigaciones Agropecuarias. (Pampa Regional Centre for Research in Agriculture and Livestock). (pp. 36-37).

The work reported includes the testing of new varieties of cereals, cotton and herbage plants produced by the local experiment stations, of new maize hybrids more resistant to root rot than Pergamino 2, a synthetic Amargo [Bitter] maize resistant to locust, and potato hybrids with longer dormancy period and good cooking quality suitable for replacing Katahdin.

Estación Experimental Nacional de Pergamino. (Pergamino National Experimental Station). (pp. 37-43).

Improved varieties have been produced in cereals, lucerne, various forage grasses, hemp and sunflower. A large collection of wheat varieties was examined for resistance to *Puccinia rubigo-vera*, *Septoria Tritici* and *S. nodorum*.

Carthamus tinctorius selections have given disappointing results.

Maize. Inbred lines of maize and sweet corn are being formed for the production of hybrids, a number of which were observed for combining ability and incidence of root rot. Hybrids from CMI were the most resistant and the most promising in general were those from CMI x CJ7; *Sclerotium bataticola* proved to be one of the main pathogens causing root rot. Genetic studies on yellow endosperm and other characters have been initiated.

Flax. Two new linen flax varieties immune to rust have been produced, one of them, Mocoví MAG, being also resistant to wilt. The new linseed variety Pampa has given 100 kg. of seed per ha. more than the most productive commercial varieties.

A key for the determination of the local varieties has been devised.

Marked differences in the biological races of *Septoria lini* have been observed.

Estación Experimental Nacional de Balcarce. (Balcarce National Experimental Station). (pp. 43-45).

Observations were made on varieties of wheat, oats and sugar beet.

Potato. Large numbers of pollinations between varieties have been effected. Observations on yield, scab resistance and virus infection showed the Argentine variety Huinkul to be the best and Sebago the worst.

Estación Experimental Nacional de Bordenave. (Bordenave National Experimental Station). (pp. 45-47).

Varietal tests were carried out with oats, rye and olive.

Wheat. A large number of hybrids were tested for grain yield and some for grazing and rust resistance.

Maize. Drought-resistant lines have been inbred and observations have been made on a number of single and double crosses. The variety Colorado Relámpago [Colorado Lightning] proved outstanding in yield and earliness.

Barley. Certain selections of forage barley from the cross Primor x Trebi have proved outstanding in appearance, disease resistance, length of growing period and tolerance of frost and grazing. Good grain yields were obtained from selections from the cross Trebi sel. Klein x Buck III.

Laboratorio de Fitopatología del Delta. (Phytopathology Laboratory of the Delta). (pp. 48-50).

The work included tests of tomato varieties for

resistance to *Lycopersicum virus 3*, and of various forest trees to *Heterodera marioni*.

Estación Experimental Nacional de Colonia Mascías. (The Colonia Mascías National Experimental Station). (pp. 51-52).

Tests have been made with varieties of rice, groundnut and linseed and with maize hybrids and the synthetic Amargo [Bitter], which has remained free from locust attack.

Several cotton hybrids have displayed superior spinning qualities and a number of others are under observation.

Estación Experimental Nacional de Concordia. (Concordia National Experimental Station). (pp. 52-54).

Studies were made on varieties of *Citrus*, olive, vine and eucalyptus, and a selection of *Trifolium alexandrinum*.

Estación Experimental Nacional de General Pico. (The General Pico National Experimental Station). (pp. 54-56).

Selections of *Sorghum aluum* tolerant of drought, frost and mowing have been produced. Observations were carried out on hybrids of wheat and on varieties of rye, sunflower, oats, lucerne, and a number of other forage legumes and grasses.

Estación Experimental Nacional Eva Perón. (The Eva Perón National Experimental Station). (pp. 56-59).

Varieties and selections of wheat, oats, malting and forage barleys, rye, sweet, grain and forage sorghums, various forage grasses and legumes have been subjected to observation.

Estación Experimental Nacional de Manfredi. (Manfredi National Experimental Station). (pp. 59-65).

Selections of wheat, rye, oats, sunflower, lucerne, black sorghum and forage and malting barleys have been under observation, together with species and varieties of various forage grasses and legumes. Cytological studies have been made of local wild leguminous species, including *Stylosanthes gracilis* var. *subviscosa* ($2n = 20$). Virus-resistant tomatoes have been obtained by selection.

Groundnut. Promising groundnut varieties improved in earliness have been selected from various crosses. *Arachis pusilla* ($2n = 40$) has been successfully crossed with *A. hypogaea*, in which the somatic number $2n = 40$ has been confirmed. Other crosses made were *A. hypogaea* x *A. villosa* and *A. pusilla* x *A. marginata*.

In crosses within *A. hypogaea* purple seed colour has been shown to be incompletely dominant to pale colour and dependent on two genes. Certain plants with coloured seeds have arisen in crosses between forms with pale seeds.

Estación Experimental Nacional de Oliveros. (Oliveros National Experimental Station). (pp. 65-68).

Reference is made to sweet sorghum selections with low cyanide content, Sudan grass with low durrin and variety tests with wheat, oats, rye, hybrid maize, sweet pepper, peas, tomato and citrus.

Some very promising linseed and linen flax selections have been effected on the basis of resistance to wilt, rust, pasmo and lodging. Some 60 selections from hybrid populations of forage barley were retained after attack by *Rhynchosporium Secalis*, *Puccinia anomala* and *Helminthosporium teres*.

Estación Experimental Nacional de Rafaela. (Rafaela National Experimental Station). (pp. 68-70).

From 60 different wheat crosses some promising disease-resistant selections have been made; also a number of disease-resistant selections of linseed, Sudan grass with low durrin content, and improved varieties of *Bromus catharticus* and a number of other forage grasses and legumes.

Varietal tests were carried out with hybrid maize, sunflower, forage and malting barleys, oats and rye.

Estación Experimental Nacional de Tezanos Pintos. (National Experimental Station at Tezanos Pinto). (pp. 70-73).

Reports are given on some promising selections of linseed and synthetic hybrids of sunflower, and on variety tests with wheat, oats, rye and barley.

Crosses with Amargo maize gave 302 susceptible: 167 resistant in the F_2 , and 108 susceptible: 103 resistant in the back cross; the deficiency of susceptibles in the F_2 is ascribed to a gametophytic gene in chromosome 1.

Good flint hybrids resistant to smut have been selected. Extremely high yields have been registered in top crosses of the double hybrid SDTP1. One of the two synthetic dent hybrids tested also gave high yields of 3346 kg. per ha.

Estación Experimental Nacional de La Banda. (La Banda National Experimental Station). (pp. 74-75).

The cotton varieties produced by the station are

proving distinctly superior to those in commercial cultivation.

Estación Experimental Nacional de Cerro Azul. (Cerro Azul National Experimental Station). (pp. 76-77).

Selections of burley tobacco made at the station have excelled Kentucky 913, and the selection Criollo Misionero [Misiones Local] shows 100% superiority over the commonly grown types in the Misiones territory.

Estación Experimental Nacional de El Colorado. (The El Colorado National Experimental Station). (pp. 77-78).

Cotton selections of excellent industrial quality combined with high yield have been produced and a number of further crosses are being studied.

Estación Experimental Nacional de Las Breñas. (Las Breñas National Experimental Station). (pp. 78-80).

A number of cotton crosses are under investigation.

Estación Experimental Nacional de Pres. R.S. Peña. (Pres. R.S. Peña National Experimental Station). (pp. 80-81).

A number of cotton hybrids, both interspecific and intraspecific, involving local cottons, which are early, productive and dependable, and some of the best foreign varieties, are being studied.

Estación Experimental Nacional de Mendoza. (Mendoza National Experimental Station). (pp. 82-85).

Selfing followed by selection is being practised on the Valencia onion to reduce bolting and other defects.

Variety tests are being carried out with lettuce, tomato, lucerne, peas, hops, olive, vines and various fruit trees.

Estación Experimental Nacional de Coronel J. J. Gómez. (Colonel J. J. Gómez National Experimental Station). (pp. 87-88).

Selection is being practised with lucerne.

Estación Experimental Nacional de Cañadón León. (Cañadón León National Experimental Station). (pp. 88-89).

Numerous hybrid seedlings of potato are being studied for leaf roll and other characters.

Selection work is in progress with lucerne, various root crops, forage plants and horticultural plants.

Estación Experimental Nacional de Salta.
(*Salta National Experimental Station*).
(pp. 90-92).

Variety tests are in progress with rice, and improved selections have been made of local, Virginia and burley tobaccos, and of sweet pepper.

2498 La Escuela Nacional de Agricultura en sus Bodas de Oro. (**The Golden Wedding of the National School of Agriculture**).

Lima 1952 : Pp. 258.

The National School of Agriculture of Peru was founded in 1902 and this memorial volume describes its foundation, development, activities and achievements. One of these was the establishment in 1927 of the experimental station at La Molina, which is known for the creation, in conjunction with Don Fermín Tangüis, of the wilt-resistant cotton that bears his name. Improvements have been effected also in sugar cane, rice, potato, wheat, maize, vines and various fruit trees.

2499 Jaarverslag over 1949. Departement van Landbouw, Veeteelt en Visserij Suriname. (**Annual Report for 1949. Department of Agriculture, Livestock and Fisheries, Surinam**) : Pp. 68.

This report (cf. Abst. 1968) contains the following information of interest to plant breeders:—

Maize. Seed of the variety Maja with a vegetation period of about 98 days was obtained from Java and may prove more suitable than the available types, which ripen later.

Rice. At the Surinam Agricultural Experimental Station the following programme will replace mass selection of rice: importation of foreign varieties and line selection of existing varieties, as well as hybridization followed by selection. In 1949 a preliminary study of a number of varieties was begun and yields of 3500 kg. per ha. or more were obtained from Skrivimankotti, No. 79, D110, Nickerie and the Javanese rice Mas. The last named and D52/37 from British Guiana were highly promising in regard to resistance to lodging and quality of the grain. Mass selection for the production of pure seed was also carried out.

Fibre plants. Clones raised from *Boehmeria nivea*, introduced from Florida and from Texas via Baarn, will be tested as a new crop for Surinam.

Seed of *Urena lobata*, bred in the Belgian Congo, was also received.

Cacao. Though selection and clone trials with a view to breeding have been limited owing to

the small amount of plant material that could be imported, this may probably result in the production of forms adapted to Surinam.

Oil palm. The possibility of growing this crop in Surinam is being examined. The question of crossing oil palm with the wild *Elaeis melanococca* to obtain a shorter trunk is being considered.

Legumes. In two small plot-trials the groundnut varieties Schwarz 21 [Black 21] and Gadjah yielded 2.46 kg. and 3.24 kg. of pods respectively, while in similar trials of soya bean Kinggit gave 2.04 kg. of seed and No. 27 gave 3.80 kg.

2500 TSCHERMAK-SEYSENEGG, E.

Wem gebührt die Priorität der Aufstellung und Anwendung der individuellen Auslese mit Prüfung der Nachkommenschaften auf dem Gebiete der Pflanzenzüchtung? (**To whom belongs priority in the exposition and use of individual selection, together with examination of the progeny, in the field of plant breeding?**)

Z. Pflanzenz. 1953 : 32 : 193-96.

The respective claims of Louis Lévêque de Vilmorin and Mendel to be the first to discover the principle of segregation in the progeny of hybrid plants in F_1 and F_2 are discussed. De Vilmorin's claim rests on a statement he made to the Société industrielle d'Angers in 1856. Mendel, although knowing nothing of de Vilmorin's views, must have considered the principle of segregation to be a self-evident hypothesis before he began his experiments into the laws of heredity in 1856, and so the two discoveries were simultaneous. Mendel, however, carried his investigations further.

2501 KOPTEV, G. S.

(**A great scientist and breeder**).

Selekcija i Semenovodstvo (Breeding & Seed Growing) 1953 : No. 1 : 45-48. [Russian].

On the occasion of his seventieth birthday on 24 November 1952, contributions to breeding, particularly of cereals, by V. E. Pisarev are discussed. Reference is made to current research by him with vegetative hybrids of buckwheat and spring wheats.

2502 La Primera Asamblea Latinoamericana de Fitogenetistas. (**The First Latin-American Conference of Plant Breeders**).

Foll. Misc. Ofic. Estud. Espec. Sec. Agric. Ganad. México, D.F. 1950 : No. 3 : Pp. 273.

A congress of the plant breeders of Latin

America was organized by the Rockefeller Foundation in Mexico City on 26 Sept.–8 Oct. 1949 and the report contains the following items of interest to plant breeders.

Harrar, J. G. *Cooperación internacional en las ciencias agrícolas. (International cooperation in agricultural sciences).* (pp. 9–10).

Large collections of varieties of wheat, maize and bean have served as starting point for breeding improved varieties which are being grown not only in Mexico but in many other countries of Latin America.

Aguirre S., C. *Comparación de rendimiento de progenes F_1 , F_2 , F_3 , y F_4 en algunos cruzamientos de maíz. (Comparison of yields of F_1 , F_2 , F_3 and F_4 progenies in some maize crosses).* (pp. 11–12).

Comparisons were made in five different crosses between a variety and a first-generation selfed line. The average yield of the 5 F_1 s was 107% of that of the open-pollinated variety used, that of the F_2 s was 97.8% and that of the F_3 and F_4 was not significantly different from the F_2 .

Martínez B., J. J. & Wellhausen, E. J. *Relación entre la coloración de plantas de maíz y el rendimiento. (Relation between colour of maize plants and yield).* (pp. 12–13).

Green plants selected from a population of the variety Rocamex V–7 gave an average yield of 207.1 grm. per ear as compared with 183.7 grm. in purple plants from the same population. The greater yield of the green plants is ascribed to blocks of genes favouring yield.

Montellano, P. *Herencia de la resistencia al chahuixtle en el maíz. (Inheritance of rust resistance in maize).* (pp. 13–14).

F_1 hybrids between resistant and susceptible plants were intermediate in reaction to *Puccinia Sorghi* and a 1 : 2 : 1 ratio was observed in the F_2 .

Ochoa, R. E. *Correlación entre el comportamiento de las líneas de maíz y el de las cruas en que han intervenido. (Correlation between the behaviour of maize lines and the crosses in which they have taken part).* (pp. 15–16).

A correlation of +0.15 was established between the morphological characteristics of a number of lines and the respective yields of their progenies when crossed with single-cross hybrids.

The correlation between date of flowering of the line and the dry matter percentage of the hybrids at harvest was –0.52.

Acosta C., A. & Castillo C., F. *Fuentes de materia genética para la resistencia al desgrane en el trigo. (Sources of genetic material for resistance to shedding in wheat).* (pp. 16–18).

Among the varieties studied, those most free from shedding were Perú, María Escobar, Aguilera, Pelón Colorado, Candeal and Kenya. Promising material has been selected from the following crosses: (Pelón Colorado x Renown) x (Renown x Supremo), (Aguilera x Kenya) x (Marroquí x Supremo), (Aguilera x Regent) x (Newthatch x Marroquí), Perú x Kenya, Kenya x General Urquiza and (Perú x Supremo) x Perú. Characters favouring resistance to shedding were short, wide, rigid glumes, strong keel, well-developed vascular tissue at the point of attachment of the glume, strong rachis and size of grain.

Enciso C., T. & Narváez M., I. *Mejoramiento de la resistencia al chahuixtle en las variedades de trigo en México. (Improvement of rust resistance in wheat varieties in Mexico).* (pp. 18–22).

Data are given concerning earliness, habit, glume characters, grain colour and resistance to lodging and to leaf and stem rust in a number of Mexican wheats and certain promising hybrids and foreign introductions.

Duarte R., E. & Carrillo A., F. *Influencia de la temperatura y fotoperiodismo sobre la precocidad en variedades de trigo. (Influence of temperature and photoperiod on earliness in wheat varieties).* (pp. 23–24).

Sowing at intervals of one month throughout the year showed that varieties introduced from Canada and the northern USA are less suitable for Mexican conditions than varieties such as Baart and Ramona, and Australian varieties such as Timstein, Gabo, Charter and Eureka.

Stakman, E. C. & Loegering, W. Q. *Razas fisiológicas de Puccinia graminis tritici en México. (Physiological races of P. graminis tritici in Mexico).* (pp. 24–26).

The races prevalent in the central zone of Mexico are often distinct from those in the north, a fact which must be taken into consideration in breeding resistant wheats; so must the possible occurrence of race 15B, to which

almost all existing varieties are susceptible, especially at high temperatures.

Hernández Xolocotzi, E. *El género Tripsacum en México. (The genus Tripsacum in Mexico).* (pp. 29-36).

Indications are given of the distribution of the main species of *Tripsacum* in North, Central and South America, with descriptions of the Mexican species. These contain both tetraploid and diploid species, and *T. Maizar* occurs in both diploid and tetraploid forms. The tetraploid species *T. laxum* and *T. pilosum* occur only in segregating populations and are thought to be amphidiploid interspecific hybrids.

Wellhausen, E. J., Roberts, L. M. & Palacios de la Rosa, G. *La parte que desempeña el teosinte en la evolución de las razas tripsacoides del maíz. (The part played by teosinte in the evolution of the tripsacoid races of maize).* (pp. 36-43).

The most primitive forms of maize in Mexico have a number of characteristics in common with the prehistoric S. American maizes and are not tripsacoid in character, a fact which lends support to the view that introgression with *Tripsacum*, or with teosinte, is of relatively recent occurrence. Cases are described where it is taking place actively at the present time in Mexico; in fields of maize infested with teosinte about 1% of intercrossing occurs in both directions. Artificial pollination of maize varieties with a pollen mixture of 50% by weight self pollen and 50% teosinte pollen from plants from the same field gave progenies containing from 0.3 to 3.85% of hybrids, whereas when the teosinte pollen was taken from plants from other areas the proportion was as much as 30%. In certain regions, the maize crossed with teosinte displays a more vigorous and fibrous root system and greater drought resistance.

Elgueta, M. *Bancos de plasma germinal y su organización interamericana. (Banks of germplasm and their inter-american organization).* (pp. 44-53).

Examples cited of plants that have become extinct include many local varieties of wheat, maize and other crops and the species *Bromus Mango* in Chile; the importance of conserving all material that could possibly be of use in breeding is emphasized, the need for this to be done on an international basis is stressed, and a possible distribution of the species in different countries of Latin American is suggested.

Rupert, J. A. *El plasma germinal disponible y necesidad para el mejoramiento del trigo en México. (Available germplasm and the necessity for breeding wheat in Mexico).* (pp. 54-62).

The special problems that exist in each of the four main wheat-growing regions of Mexico are outlined. The main races of stem rust are 17, 19, 38, 56, 59 and 59A, and the varieties Newthatch, Kenya 324 and Supremo have been used in breeding for resistance; promising hybrids from Newthatch x Marroquí and Kenya 324 x Mentana are being multiplied; they are however susceptible to leaf rust and are being further crossed to a hybrid Perú x Supremo and other resistant varieties. Resistance to shedding has been encountered in the hybrids (Aguilera x Kenya) x (Marroquí x Supremo) and (Aguilera x Regent) x (Newthatch x Marroquí) and hybrids from the variety Perú. Rust resistant hybrids with short, strong straw have been obtained from the cross Newthatch x Marroquí; several others are early and mature in 90 days in summer sowings.

No sources of resistance to foot rot caused by *Sclerotium Rolfsii* have so far been found, or to *Sclerospora macrospora*; and drought resistance is found only in Sonora and the *Triticum turgidum* variety Barrigón, both low in quality. Certain hybrids, e.g. those from Kenya x Mentana, seem to possess particular aptitude for growing on poor land with low N and P contents.

Muñoz, J. M. & Cárdenas, R. *Variación genética de los frijoles de México. (Genetic variation in the Phaseolus beans of Mexico).* (pp. 62-71).

A collection has been made of all the types in cultivation in the different regions of Mexico, together with a certain number of forms found growing wild. Many of the types are very mixed and selections have been made of the most promising lines. Tabular data are given showing the variation in morphological characteristics of the plants, pods and seeds, and in earliness and attack by diseases and pests. *Ph. lunatus* possesses resistance to *Uromyces Phaseoli* and to *Apion* sp., and resistance to various ailments occurs scattered in the different groups.

Roberts, L. M. *Las razas mexicanas de maíz más útiles como material básico para su mejoramiento. (The Mexican maize races most useful as basic material for breeding).* (pp. 71-84).

Collections have been made in which practically

all the maize forms existing in Mexico are represented, and the most interesting of them are described. Some of them are primitive popcorns or hybrids from them, and possess certain features, such as earliness, which may be useful in breeding.

Guzmán, V. L. & Páez, J. *Experimentos comparativos de variedades de vainitas. (Comparative experiments with bean varieties).* (pp. 84-89).

The variety Kentucky Wonder gave significantly higher yields than other varieties tested.

Brieger, F. G. *A distribuição do milho indígena e comercial. (The distribution of indigenous and commercial maize).* (pp. 90-95).

The three primary regions of domestication of maize are given as (1) the basins of the Pilcomayo-Paraguay-Paraná rivers, containing some promising popcorns; (2) the upper basin of the Amazon where the long-ear soft corn occurs; and (3) the Inca region between Chile and Colombia. The author disagrees with the viewpoint that the Cateto orange flint maize of the River Plate area is of European origin and the opinion is expressed that the indigenous maizes of South America cover the whole gamut of climatic adaptation from sea level to 3500m. altitude, and embrace almost all types of maize known in modern commerce.

Villamil García, F. *Resultados obtenidos en el mejoramiento del maíz amarillo a base de cruzamientos múltiples línea S_1 x variedad, para producir variedades sintéticas. (Results obtained with breeding yellow maize by multiple S_1 line x variety crosses, for the production of synthetic varieties).* (pp. 96-107).

Some 500 self pollinations were made in five different varieties and in each the 100 best ears were selected; 15 grains from each were sown in the midst of the parent variety and emasculated, so that the cross S_1 x variety was effected, and their yields were compared in a simple lattice test. The crosses were arranged in four groups according to their yield and mixed seed of each group was sown for the production of synthetics, the groups containing varying numbers from 4 to 16. No significant yield difference was established between the yields of the synthetics and that of standard varieties or the intervarietal hybrid Cuba x Colombia but the synthetics were notably more uniform in plant and ear characters.

Gacitúa L.-R., H. *Producción de maíz híbrido y selección de líneas puras en Chile. (Production of hybrid maize and selection of pure lines in Chile).* (pp. 107-19).

Tests were carried out in three different localities in Chile with 13 maize hybrids imported in 1941 from the USA. Only Iowa 4193 proved substantially better than the local open-pollinated varieties and seed of this hybrid is now being produced in Chile from its inbred parents; it exceeds the best local variety by about 20% in yield.

A number of other lines introduced from the USA have been tested in top crosses with two local varieties; 16 out of 52 crosses made proved promising. Self pollinations have been made of some of the Chilean varieties and the combining ability of the selfed lines is being tested; increases of up to 34% in yield over the standard varieties are reported.

Wellhausen, E. J. *El programa de mejoramiento del maíz en México. (The programme of maize breeding in Mexico).* (pp. 119-49).

Certain open-pollinated varieties developed in Mexico have given 15 to 35% more yield than the common varieties such as Chalco, and their characteristics are described. Self pollination has been carried out on 35 varieties from different areas and the best inbred lines have been tested in top crosses. A high correlation was observed between the performance of an inbred line and that of its top-cross hybrids. The best double cross hybrids were in general obtained from the best inbred x variety hybrids, and their yields varied from 135 to 14.3% of that of the control variety Urquiza; advanced generations from these retained a yield of 126% that of Urquiza; synthetics have been formed by mixing two double crosses of this type and producing the advanced generations; some of them are being grown extensively owing to their wide adaptation, good yield and drought resistance; and one of them, Rocamex VS-101, has given an average yield of 35% more than the local variety Mex. 39.

An attempt has been made to produce hybrids which even if allowed to grow on will form good synthetics, but figures are given which show that whereas a multiple hybrid yields 16% more than the best open-pollinated selections, a good triple hybrid yields 27% more; an early maturing double cross designed to replace Mex. 39 has yielded 48% more than that variety and is also superior to it in standing capacity; others cited

yield 20–35% more than the best local varieties. The data so far available indicate that inbreds of later generations have greater combining abilities than the first-generation inbreds, there being a correlation of +0.45 between the combining ability of the S_1 and that of the later generations of the same line. For this reason, all the best double crosses that have been made from first-generation inbreds are being repeated with later inbred generations.

Del Valle, C. G. Métodos empleados en el desarrollo de una variedad nueva de maíz blanco en Cuba. (Methods employed in the development of a new variety of white maize in Cuba). (pp. 150–54).

The dent corn variety Jobo was obtained by selecting the occasional white grains that occurred in two Cuban varieties and later intercrossing them. The resulting population was subjected to further selection, by which means a stable type which maintains its yielding ability has been obtained. It is used for producing flour which is mixed with wheat flour in making macaroni products.

Guzmán, V. L. Producción de maíz dulce para mesa en el Perú. (Production of sweet corn for table purposes in Peru). (pp. 154–63).

A number of crosses have been made between Peruvian maize varieties and sweet corn varieties from the USA, followed by back crossing to the USA sweet corns.

Brieger, F. G. A explicação teórica da heterose e os métodos de melhoramento do milho. (The theoretical explanation of heterosis and the methods of maize breeding). (pp. 164–69).

Though admitting that subviable mutant genes do occur, it is submitted that their frequency in a cross-pollinated plant such as maize would be too low to account for the phenomenon of heterosis, which is explained on the basis of "mutations for heterotic genes." Reference is made to balanced heterotic populations of Piracicaba sweet maize which have maintained their yield for four years with open pollination and mass selection and the view is expressed that it should be possible to produce balanced synthetics to replace most or all of the hybrid corns.

Borlaug, N. E. Métodos empleados y resultados obtenidos en el mejoramiento del trigo en México. (Methods employed and results obtained in breeding wheat in Mexico). (pp. 170–87).

A large number of lines selected from the mixed

local populations, together with a number of varieties introduced from abroad, have been tested in four different parts of the country, the conditions of which are specified. None of the selections from local bread wheats possessed satisfactory resistance to stem and yellow rust and to lodging. The most promising introductions were those from Kenya and they have been subjected to further selection. Bulk hybrids obtained from the USA have provided a useful source of breeding material, from which two valuable wheats have been selected, namely Supremo from Surpresa x (Hope x Mediterranean) and Frontera from Fronteira x (Hope x Mediterranean). The former variety has done very well and is resistant to stem, leaf and yellow rust, highly productive and adapted to a wide range of conditions, though it is not recommended for conditions where shedding is a problem.

Promising hybrids produced include Yaqui, Nazas and Chapingo from Newthatch x Marroquí and Kentana from Kenya x Mentana, each specially adapted to one of the four main zones. Two crops a year are obtained from hybrid material under multiplication, which includes several complex crosses combining resistance to all three rusts, good rachis, strong glumes and freedom from lodging.

Vargas C., C. Algunos resultados de investigaciones con papas nativas peruanas. (Some results of investigations with native Peruvian potatoes). (pp. 187–200).

A collection of over 1200 cultivated potatoes, mostly from outlying districts in southern Peru, has been classified and studied, together with a certain number of wild species from the Cuzco area. *Solanum Juzepczukii*, *S. Chaucha*, *S. curtilobum* and certain forms of *S. andigenum* are indicated for their earliness; *S. goniocalyx* and *S. andigenum* for yield; *S. andigenum*, *S. tenuifilamentum*, *S. mamilliferum*, *S. stenotomum* and *S. goniocalyx* for quality; *S. Juzepczukii*, *S. curtilobum* and *S. andigenum* for disease resistance; *S. Juzepczukii* and *S. curtilobum* for frost resistance; *S. lignicaule*, *S. Lechnowiczii*, *S. calcense*, *S. canasense* and *S. pumilum* for tolerance of arid conditions; and *S. raphanifolium*, *S. Aracc-papa* and *S. multi-dissectum* as tropophytes.

Hawkes, J. G. El programa del mejoramiento de la papa en Colombia (The programme of potato breeding in Colombia). (pp. 201–13).

See PBA Vol. XXII, Abst. 2808.

Vallega, J. *Resultados obtenidos en las investigaciones sobre el potencial patógeno de las especies parásitos que afectan a los cereales, sobre la búsqueda de factores genéticos de resistencia con respecto a las mismas, y lo que estos conocimientos significan para la selección de variedades resistentes a las enfermedades.* (Results obtained in investigations on the pathogenic potential of the parasitic species which affect the cereals, on the search for genetic factors for resistance to them and the significance of this knowledge for breeding disease-resistant varieties). (pp. 214-19).

Studies of the physiological forms occurring in Argentina have been made in collaboration with specialists in Chile, Uruguay, Brazil, Peru and Bolivia. As examples of the success of breeding work, the production of wheats such as La Previsión 25 and Klein Lucero, resistant to *Puccinia rubigo-vera*, and Sinvalcho and Klein Orgullo [Klein Pride], resistant to the main races of it, are cited. The main change in the racial composition is the increasing spread of race 15, to which attention is now being given in breeding work. The most useful sources of resistance genes are Rieti and other Italian wheats, Hope, and Chinese 466.

Cortázar Sagarmínaga, R. *Producción de trigos resistentes a los polvillos colorados (Puccinias) en Chile.* [Production of wheats resistant to rusts (*Puccinia*) in Chile]. (pp. 220-32).

Data are given showing the damage caused by the three rusts in Chile and the benefit that may be gained by growing resistant varieties. The varieties Kenya, Thatcher and McMurachy have been used as a source of resistance to *Puccinia graminis*, in crosses with the Chilean wheats Lincoyán and Enrique Matte and with Mentana, which is well adapted to Chilean conditions. The hybrids were back-crossed mainly to Mentana. The Thatcher hybrids retained their resistance in the back crosses to a greater extent than those from Kenya, and their yielding ability was generally better. The hybrids from Lincoyán were also distinguished by good yields. In crosses with Cappelli, the variety Iumillo has been replaced by Giza as the resistant parent. Newthatch has been used recently as a parent possessing resistance to both *P. graminis* and *P. trititina*.

Niederhauser, J. S. *Enfermedades del maíz en México y variedades resistentes.* (Diseases of maize in Mexico and resistant varieties). (pp. 232-35).

Studies are being made of the resistance of maize hybrids to ear rot caused by *Fusarium moniliforme*, to various races of rust (*Puccinia Sorghi*) and to the corn-stunt virus.

McKelvey, J. J. *Resistencia al picudo del ejote en las variedades de frijol en México.* (Resistance to the pod weevil in bean varieties in Mexico). (pp. 236-40).

The varieties Hidalgo 6 and Hidalgo 24 were consistently less infested by *Apion godmani* than others in the early group, Puebla 32 and Puebla 2 in the medium group, and Hidalgo 33-A-1 in the late group.

Palacios, R. *La eficiencia relativa del diseño lattice simple sobre lotes completos al azar, en ensayos de rendimiento con maíz.* (The relative efficiency of the simple lattice design compared with complete randomized blocks in yield tests with maize). (pp. 241-44).

A gain of some 25% in efficiency from the use of simple lattice designs is reported.

Fischer, G. J. *El ensayo de variedades complejo en la fitotecnia Rioplatense.* (The complex variety test in plant breeding in the River Plate area). (pp. 244-62).

The importance of taking into consideration such factors as time of sowing, occasional extremes of climatic conditions, type of soil, level and type of farming, and incidence of pests and diseases is stressed and reference is made to international tests of wheat varieties carried out in Brazil, Argentina and Uruguay.

2503 LARROQUE, P.
Nouvelles méthodes d'amélioration génétique des plantes cultivées. (New methods of genetic improvement of cultivated plants).
Agros, Rio Grande do Sul 1952 : 5 : 169-78.

The author demonstrates his method of selection on the basis of associated character complexes for Brazilian plant breeders (cf. Abst. 1123).

2504 KUPERMAN, F. M.
(Some principles of form development in plants and their application to breeding).
Selekcija i Semenovodstvo (Breeding & Seed Growing) 1952 : No. 11 : 12-22. [Russian].

The application of Lysenko's theory of developmental phases to plant breeding, particularly to the production of new forms of cereals, is outlined. Varied external conditions can have the following effects upon plant organisms: (1) cause rapid growth and retard the development of reproductive organs; (2) retard the former and accelerate the latter process; (3) stimulate growth and development, and (4) slow down both processes. From the breeder's viewpoint, agrobiological methods which promote vigorous growth of a plant during the vegetative phase and retard its development during the reproductive phase, and methods which stimulate both growth and development, are important. The former technique can be used for developing productive new forms, such as cereals with large or branching ears and the latter for maintaining good productive material in a uniform and healthy state.

- 2505 EKEN, C.
Fachliches aus Westeuropa. Noch einmal Schutz der Züchtungsarbeit. (**Technical information from Western Europe. Once again, protection of the work of the breeder**).
Saatgutwirtschaft, Stuttgart 1953 : 5 : 60-61.

The question of legal rights for the plant breeder is discussed with emphasis on the international aspect, including the standardization of varietal names.

- 2506 BARTON, L. V.
Seed storage and viability.
Contr. Boyce Thompson Inst. 1953 : 17 : 87-103.

Data are given on the effect of extended storage under different conditions on the viability of various seeds including cotton, vegetables and forest trees. A high germination capacity was retained for about 5 years in sealed containers at 5° C and for 10 years or more at -4° C. The practical significance of storage is discussed, with special reference to breeding programmes, genetical studies and maintenance of seed stocks of plants, especially conifers, which give good seed crops infrequently.

- 2507 HALIFMAN, I. A.
(**The use of pollination by bees in plant breeding and seed growing**).
Selekcija i Semenovodstvo (Breeding & Seed Growing) 1953 : No. 1 : 22-26. [Russian].

Breeders have hitherto neglected the develop-

ment of characters which attract bees and ensure cross-pollination. In cotton they must seek to confine nectar only to the flowers; in sunflowers, to increase the secretion of nectar, and to make pollen grains which the bees can carry and to eliminate sticky receptacles which trap bees. It is pointed out that the pollen grains of some flax varieties are too heavy to be carried by the wind; that the distribution of pollinating varieties of tree and bush fruit varieties, among self-sterile varieties in an orchard, should be determined by the flight-habit of bees; that the best crop of buckwheat seed results from cross pollination between the type of plant of one variety which bears flowers having short anthers and long styles, and the type of plant of a second variety which bears flowers having long anthers and short styles, plants of the second type in each variety being hoed out when the buckwheat crop is about to flower. Bees can be induced to visit a particular crop of peas by feeding them on syrup in which pea flowers are steeped, cross pollination being thus ensured without recourse to emasculation.

- 2508 ADDENS, N. H. H.
Zaaizaad en pootgoed in de Nederlandse Landbouw. (**Seed and seed potatoes in Netherlands Agriculture**).
Wageningen 1952 : Pp. 282.

In the introduction to this thesis the importance of high quality seed of good varieties is emphasized. The following aspects of the subject are then considered: seed standards and field inspection of seed crops; the use, handling and purchase and sale of seed; local and regional exhibitions; and new crops and varieties from the historical standpoint, with observations on testing and registration.

- 2509 SCHELL, H.
Ist das gegenwärtige Verfahren der Zulassung von Sorten landwirtschaftlicher Nutzpflanzen in Ordnung? (**Is all well with the present certification procedure for varieties of agricultural crop plants?**)
Saatgutwirtschaft, Stuttgart 1953 : 5 : 117-19.

The official requirements that must be fulfilled by German seed growers and breeders are discussed with reference to proposed legislation on the certification and approval of new varieties of agricultural and horticultural crop plants.

- 2510 SKAARE, S.
Tiltak for å fremme frøavl. Organisert utenlandsk frøavl av sorter og stammer for norske forhold. (**Steps to promote seed production. Organized foreign seed production of varieties and strains for Norwegian conditions**). Norsk Landbr. 1953 : 19 : p. 220.

The question of the production of seed in Canada, Denmark or the USA for use in Norway is briefly discussed, with comments on the special seed supply problems of the last named country.

- 2511 KUSATZ, H.
Eine graphische Darstellung des naturgesetzlichen Anbauwertes von Sorten, auf Grundlage mehrjähriger Sortenversuchsergebnisse. (**A graphical representation of the naturally determined cultivation value of varieties on the basis of the results of variety trials over several years**). Bodenkultur, Wien 1953 : 7 : 10-11.

A form of graphical representation is described for facilitating the comparison of varieties under differing climatic or other conditions.

The percentage difference in yield of each variety compared with the average for all varieties is plotted along a series of vertical coordinates, each coordinate representing a location or set of external conditions. The points representing each variety are then joined by connecting lines.

- 2512 Jahresbericht der Biologischen Bundesanstalt für Land- und Forstwirtschaft in Braunschweig. (**Annual Report of the Federal Biological Institute for Agriculture and Forestry in Brunswick, 1951**). 1952 : Pp. 100.

The work reported includes tests of potatoes for reaction to virus X, in which Fortuna proved hypersensitive and field immune (cf. Abst. 2806). Resistance to leaf roll was noted in Aquila, Panther and Cornelia. Varieties showing more than average resistance to streak and mosaic viruses and to scab and wart are listed. *Solanum Vernei* has displayed nematode resistance and *S. chacoense* was shown, in addition to *S. demissum* and *S. polyadenium*, to contain a substance repellent to Colorado beetles. Investigations continued on the reaction of newly bred cereal varieties to frost, rust and other diseases, of beet varieties to *Cercospora* and of beans to *Gloeosporium*, and on the biotypes of *Puccinia glumarum* (cf. PBA, Vol. XXII, Abst. 1092).

- 2513 JAMALAINEN, E. A.
Vuoden 1952 kasvitautitilanne. (**The position in plant diseases in the year 1952**). Koetoiminta ja Käytäntö 1952 : 9 : No. 12 : 1-2.

In this survey of the incidence of various pathogens on a number of different crop plants during the year 1952, data are included of the reactions of the following varieties:—

Rye. The indigenous Finnish varieties Greus, Ensi [First] and Toivo [Hope] show a high degree of tolerance to snow mould (*Fusarium nivale*) as compared with Onni (Fortune), Pekka and Oiva [Excellent].

Apple. Resistance to scab, *Venturia inaequalis*, was found to be high in Antonovka, Kaneliomena (Cinnamon), Åkerö, Wealthy and Valkea Kuulas, and weaker in Atlas, Lobo, Melba, Patricia, Rupert and Snygg.

- 2514 DUCKART, W.-J.
Ist unsere Pflanzenzüchtung an der zunehmenden Anfälligkeit der Kulturpflanzen schuld? (**Is our plant breeding to blame for the increasing susceptibility of crop plants?**) Saatgutwirtschaft, Stuttgart 1953 : 5 : 119-21.

While admitting that modern plant breeding methods have eliminated to some extent the beneficial effects of natural selection with regard to resistance to pests, frost, drought and other environmental factors, the writer holds that it should be possible to counteract this undesirable effect by using modern breeding techniques to increase the vitality of varieties that are in some respects too highly bred. The excessive use in plant protection of chemicals which often destroy many beneficial insects would thus be avoided, and the balance of nature to some extent restored.

- 2515 ASUYAMA, H.
(**The present position of breeding disease resistant varieties in the United States**). Ikushugaku Zasshi/Japan. J. Breeding 1952 : 1 : p. 263. [Japanese].

A short general review in Japanese is given of current American programmes for developing crop plants resistant to diseases and pests.

- 2516 TVERSKOĬ, D. L.
(**Discussion on questions of the immunity of plants to diseases and pests**). Agrobiologija (Agrobiology) 1953 : No. 1 : 147-152. [Russian].

The principal reports read at a conference, held

at Leningrad in November 1952, were *The problem of breeding domestic plants for immunity* by P. M. Žukovskii, *The methods of removing the causes of weakening resistance of plants to diseases* by T. I. Fedotova and *Modern knowledge of the resistance of agricultural plants to pests* by P. G. Česnokov.

In the debate that followed, several speakers, notably Zak, Muravjev, Ševčenko and Jarkina, regarded artificial infection of plants as an efficacious method of breeding for resistance to diseases; Kvasnikov, Fomin and Muromcev rejected the method, while approving a less drastic expedient of training material in infected soils, and lastly the most numerous group, which included Alpatjev, Koroleva, Babajan, Filippov and Anpilogov, advocated the cultivation of new varieties of plants, above all, for productiveness and vigour, and testing their degree of resistance only at initial and final stages. Many speakers shared the view that the degree of resistance of plants to diseases can be improved by supplying them with some nutrients and microelements. Others referred to vegetative hybridization as a good method of breeding plants for immunity. Some new varieties of economic plants, including wheats, sugar beets and tobaccos, showing resistance to various diseases, were mentioned.

2517 BOERGER, A.

Panorama de la genética Rioplatense en inmunidad vegetal. (**Review of the genetics of plant immunity in the Río de la Plata**).

Genet. Iber. 1952 : 4 : 71-90.

The substance of this article has already appeared in a more extended form in the work referred to in *PBA*, Vol. XXIII, Abst. 1014.

2518 **Proceedings of the joint meeting of the north central weed control conference (9th annual) and the western Canadian weed control conference (6th annual), Winnipeg, Canada, December 9, 10, 11, 1952 :** Pp. 125.

Dunham, R. S. *Effects of herbicides on flax.* (pp. 4-5).

An analysis of the effects of spraying with 2,4-D has shown that the extent of delay in ripening depends on the variety and date of sowing. No apparent change in response to 2,4-D has been recorded as a result of spraying three successive generations of Redwing, Minerva and Redwood.

Alban, E. K. *Pre- and post-emergence weed control in onions.* (pp. 77-81).

Under Ohio conditions, potassium cyanate,

sodium isopropyl xanthate, sodium pentachlorophenate, sodium trichlorophenate, isopropyl-N-(3-chlorophenyl) carbamate and ethyl xanthogen disulphide were safely used for a single post-emergence treatment of Brigham Yellow Globe, but caused significant yield reductions of Sweet Spanish.

2519 **Progress Report of the Dominion Experimental Station, Prince George, British Columbia, 1940-1951 (1953) :** Pp. 64.

The results of cereal variety trials are summarized. Tree and small fruit varieties are recommended. Tests are being carried out on local selections of apple, plum, cherry and apricot.

2520 **Recommended varieties of grain crops for Saskatchewan for 1953.**

Saskatch. Co-op. Agric. Ext. Progr. 1953 : Pp. 8.

Brief descriptions are given of varieties of bread and durum wheat, oats, rye, barley, flax and field peas and beans recommended for particular soils and climatic conditions in Saskatchewan on the basis of widespread varietal trials.

2521 **1952 variety performance trials of field crops.**

Ga Agric. Exp. Sta. 1953 : Pp. 34.

A summary is given of the results of variety trials of wheat, oats, maize, barley, cotton, flue-cured tobacco and soya bean, conducted in Georgia during 1952 and previous years.

CEREALS

2522 PAATELA, J.

Tärkeimmät viljalajikkeemme ja niiden viljelyalueet. (**The more important cereal varieties in Finland and their areas of cultivation**).

Suom. Maataloust. Seur. Julk. 1953 : 80 : 3-4.

The findings are given of a survey made in 1950 and again in 1951 of the areas of different cereal varieties grown in different parts of Finland. The crops studied were winter and spring wheat, rye, barley and oats. Data for the two years are compared and the reasons underlying the changes observed are analysed. Most important among the conclusions drawn are: that late varieties tend to be grown too far north, although there are indications of earlier varieties gaining ground; rye varieties with superior winter hardiness are most commonly cultivated in central and eastern Finland, where snow is deepest and resistance to snow mould of greatest

importance; two-rowed barley varieties are practically restricted to southern and central Finland; oats are predominantly pale-grained varieties, and of these a half to one third yellow-grained.

- 2523 **Small grain varieties—for Indiana.**
Sta. Circ. Purdue Agric. Exp. Sta. 1953 :
No. 391 : Pp. 4.

Descriptions are given of recommended varieties of soft red winter wheat, spring and winter oats and winter rye. One of the two winter oats recommended is the new variety Dubois (cf. Abst. 1902).

- 2524 **Plant breeding in the seed trade.**
Agric. Merch. 1952 : 32 : 204-06; 234-36;
257-58; 322-24.

Recent work carried out by four private firms specializing in breeding cereals and forage grasses and legumes in England and Scotland is outlined. Particular attention is given to promising selections from crosses to (1) combine grain quality and rust resistance of local wheats with the short straw of French and Belgian varieties suitable for combine harvesting; (2) improve the lodging resistance of wheat and oats; (3) increase the hardiness of oats; and (4) incorporate the short straw and early maturity of Scandinavian barleys in local Archer types.

- 2525 **LASSER, E.**
Ergebnisse der Getreidesortenversuche
des Anbaujahres 1951/52. (**Results of
the cereal variety tests for the year
1951/52**).
Kärntner Bauer 1953 : 103 : 129-30.

Special mention is made of Dr. L. Kärntner and Oberkärntner winter ryes on account of their rust resistance in Austrian conditions, Kefermarkter rye for its high yield, Dr. L. Hellkorn winter wheat for its rust resistance, high baking quality and good yields under less favourable conditions of cultivation, and Bayerngerste [Bavaria barley] for its long, lax ears. Rust-resistant forms of yellow and white oats and spring wheat are among the breeding material.

- 2526 **SCHÖBER, K.**
Vorschläge zur Neuorganisierung der
Getreidezüchtung. (**Proposals for re-
organizing cereal breeding**).
Landw. Wien 1953 : 4 : 117-19.

It is pointed out that attempts to introduce varieties from Bavaria and other adjacent countries into the main cereal areas of Austria have not been successful and in view of the fact

that the main Austrian cereal varieties are 20 years old or more, the need for organizing cereal breeding on a national basis is urged.

- 2527 **GRADO, A. de**
Ensayo comparativo de variedades de
trigo. Cultivo de trigo en ciclo corto.
Estudio sobre hibridación de trigos.
Selección de avenas por líneas puras y
ensayo de variedades de maíces. (**Com-
parative test of wheat varieties.
Cultivation of wheat in a short
growing season. Study on wheat
hybridization. Selection of oats by
pure lines and test of maize varieties**).
An. Inst. Invest. Agron., Madr. 1953 : 2 :
75-90.

The wheat 100-30 bred by the Centre for Cereal Cultivation in Madrid has given the best results of any of the new wheats tested, though it was somewhat below the local variety Granja Badajoz 04 [Badajoz Farm 04] in yield. Observations on 11 hybrids from Leciñena 04 x Littorio showed some of them to be less prone to lodging and rust attack than the parent Leciñena 04.

Of the two oat selections tested, 015 proved slightly superior to 050 in yield, rust resistance and standing capacity, and has been named Badajoz 015.

Data are given concerning tests of a number of maize varieties in respect of yield, smut resistance and earliness.

- 2528 **Quarterly Review of the Cyprus
Department of Agriculture for 1st
October to 30th December, 1952 :**
No. 30 : Pp. 40. (Mimeographed).

Two new wheats, S₁ and S₂, have been released for seed production; under fertile conditions they have given outstandingly good yields. Under poorer conditions the old Cyprus variety, Psathas, has maintained its superiority. Many wheat and barley crosses are under test.

- 2529 **DE LARAMBERGUE, R.**
Quatre années d'expérimentation sur les
céréales en Alsace. (**Four years of
experiments on cereals in Alsace**).
Bull. Tech. Ing. Serv. Agric. 1952 :
No. 72 : 509-12.

The results of trials of winter wheats, oats and maize are recorded for the period 1947-51.

Winter wheat. The variety Pèvèle is recommended for its yield on good soil and for its baking quality, but it is susceptible to smut. Colmar and Hybride de la Noue, two rather similar wheats bred by the Colmar Plant

Breeding Station from the cross Vieux Ferette x Vilmorin 27, resemble Vilmorin 27 in height, appearance and baking quality, but Colmar has red ears and the other white. Both give good yields and equal Côte d'Or in resistance to cold. Two other wheats, Dômes and Magdalena, bred by the Clermont-Ferrand Plant Breeding Station, have given promising yields combined with very good baking quality. Both are resistant to cold and yellow rust and not very susceptible to black rust. Dômes, which has the longer straw, lodges more readily in rich soils.

Oats. Avoine de Versailles, Pégase and Véga were bred at the Versailles Plant Breeding Station. The first, a black oat of good quality, is suitable for soils of medium fertility. The white variety Pégase and the black-grained Véga both have short straw and grain of good quality. All three suffer little from frit fly, either owing to innate resistance or their developmental rhythm which enables them to escape attack.

Maize. Out of eight American and French hybrids tested, United 22 and Wisconsin 255 gave the best yields and seem best suited to the regional climatic conditions. In general the American hybrids were more resistant to drought than the local varieties.

2530 Atti del Convegno Internazionale di Cerealicoltura Mediterranea, Lonigo, 1-2 Giugno 1952. (Report of the International Meeting on Mediterranean Cereal Cultivation, Lonigo, 1-2 June 1952).

Genet. Agr. 1953 : 3 : 273-448.

The report contains the full text of the addresses of welcome and other formalities, and of the papers read at the meeting, which included the following.

De Cillis, U. *Lo stato attuale della diffusione delle varietà elette di frumento in Italia.* (The present state of the distribution of bred varieties of wheat in Italy). (pp. 293-316).

The area under improved varieties was 78.5% in 1951 as against 62% in 1934; the most widely grown of all was Senatore Cappelli, a selection from the *Triticum durum* variety Mahmoudi; the second was Mentana, followed by Frassineto and a number of hybrids derived from Strampelli's cross Akagomuchi (Akagomugi) x (Wilhelmina x Rieti). Certain varieties were confined to limited areas; of the 22 varieties in most extensive cultivation, 5 are *T. durum* and the rest *T. vulgare*, the *T. durum* varieties being confined mainly to southern Italy and the

islands, where the proportion of bred varieties has tended latterly to decrease somewhat, owing to the absence of suitable types. Other zones that have been neglected by breeders in the past are the highland and alpine areas and new varieties suitable for these areas, such as Est Mottin, Impeto, Tevere and San Pastore, are extending rapidly.

Gadea, M. *Nota informativa sulla coltivazione dei frumenti italiani in Spagna e loro possibilità.* (Report on the cultivation of Italian wheats in Spain and their possibilities). (pp. 317-19).

Information is given on varieties such as Cappelli, Mentana and Rieti, which have been grown in Spain for some time, and on Quaderna, Libero and Roma, introduced more recently. A large number of others are at present undergoing observation.

Papadimitriou, P. *Le varietà Italiane di grano coltivate in Grecia.* (Italian wheat varieties grown in Greece). (pp. 320-24).

Italian varieties introduced into Greece in 1931 gave 30-50% more yield than the local wheats and data are given concerning the varieties that have given the best results in different parts of the country.

Graça, L. Q. *Blés précoces et blés italiens en Portugal.* (Early wheats and Italian wheats in Portugal). (pp. 325-33).

Quaderna, Roma and Mentana are grown in Portugal but all suffer from shedding. Preliminary data on the behaviour of some of the newer varieties tested in different parts of Portugal suggest that Autonomia, Russello SG7, Tevere, Florio and Turano are among the most promising.

San Martini, F. *Il frumento nella Repubblica di S. Marino.* (Wheat in the Republic of S. Marino). (pp. 334-35).

Promising results have been obtained with the hybrids Villa Glori x 96 and Mentana x *Aegilops ovata*, which have proved more resistant to heat, lodging and generally unfavourable conditions than Mentana, Autonomia and Frassineto.

Vilmorin, M. de. *Rapport sur les blés italiens cultivés en France.* (Report on the Italian wheats cultivated in France). (pp. 336-37).

Italian varieties have done well in the south of France but are now being superseded by wheats with greater resistance to *Puccinia graminis* such as Étoile de Choisy, Docteur Mazet and Vilmorin-Sud.

Grégoire, M. *Rapport sur le comportement des variétés de blés italiennes. (Report on the behaviour of Italian varieties of wheat).* (pp. 338-41).

The merits and defects of a number of Italian wheats tested in France are enumerated. Some appear promising from the point of view of yield and resistance to lodging and *Puccinia graminis*.

Grillot, G. *Les blés italiens au Maroc. (Italian wheats in Morocco).* (pp. 342-46).

Italian varieties have not proved suitable for direct introduction and very few of them have given good results in crosses; one segregate from the cross Mentana x 588 (Florence x Aurore) combines yielding ability with earliness and good baking quality, another from Damiano x Pusa 62 combines medium yield with high baking quality.

Gökgöl, M. *Les différentes espèces de blé italien en Turquie. (The different kinds of Italian wheat in Turkey).* (pp. 347-50).

It is pointed out that the wheat Saragolla grown in southern Italy is derived from a Turkish land race. In Turkey good results have been obtained with Mentana, which has proved resistant to *Puccinia glumarum*, to *P. triticea* and to lodging and is earlier than the *T. turgidum* varieties previously grown. It has been used in crossing and is one of the parents of the variety 0093-94. Others being used as parents at the Yeşilköy breeding station are Libero and Roma.

Le varietà di frumento italiano coltivate in Tripolitania. (The varieties of Italian wheat cultivated in Tripolitania). (pp. 351-55).

Mentana and Quaderna have done well in the past and in 1948 a number of other Italian varieties and one Tunisian wheat were planted for testing; Florence x Aurore, the Tunisian variety, and Falcone have proved satisfactory in yield, earliness and disease resistance.

Forlani, R. *I frumenti perenni dal punto di vista sperimentale. (Perennial wheats from the experimental standpoint).* (pp. 367-68).

It is pointed out that the *Triticum* x *Agropyron* hybrids produced so far are of little or no interest for the sake of their grains, but may afford useful breeding material for areas with highly unfavourable growth conditions.

Lutri, I. *Nuovi grani duri e teneri creati in Sicilia. (New hard and soft wheats created in Sicily).* (pp. 373-89).

In southern Italy and Sicily, drought and damage from heat during the development of the grain are the main obstacles to wheat cultivation, and the highly bred varieties selected by Strampelli and others in Central Italy have not been able to compete with the local wheats such as Rossello and Ruscia. These were therefore used in crossing with an early-maturing wheat Azizia; from Rossello x Azizia three good varieties of *T. durum* were obtained, namely Sicilia, Francesco Lutri and Francesco Crispi, which are described; they ripen a week earlier than Rossello and Cappelli, give fairly good yields of grain of good quality for household bread-making and are free from lodging.

The locally cultivated soft wheat Maiorca crossed with Mentana gave rise to a winter wheat Agrella, which at Ragusa, on the 37th parallel, comes into ear in the middle of February, three weeks before Mentana, and ripens in the middle of April, 15 days before Mentana and over a week before the barleys; at Palermo it completed its development in 165 days. Two subselections, Agrella₂ and Agrella₃, 1-2 and 3-4 days later in maturity respectively, but superior in yield, have also been isolated; they are suitable for slightly cooler zones than Agrella₁, which is adapted to hot areas of very low fertility. All can be grown without fear of drought damage even in zones where the rains stop in February, and although they do not altogether escape damage from heat, the effects are much less serious than in later-maturing varieties; where summer rains or irrigation permit it, a second crop can be reaped in September.

Jacometti, G. *Razze italiane di grano di qualità. (Italian varieties of quality wheat).* (pp. 390-95).

The speaker describes how he selected five distinct types from Manitoba wheat, crossed them with Villaglori and from among the hybrids selected the two well-known wheats Carme Jacometti and Torino; the former is early, resistant to rust, cold and lodging, and gives a good yield of grain of quality comparable with Manitoba.

Reference is made to experiments on increasing the yielding ability of wheat varieties by selecting for supernumerary spikelets in the ear and to certain selections which bear an average number of 80-100 grains per ear.

Maliani, C. *Sulla tecnica culturale del grano "S. Pastore fam. 14"*. (*The technique of cultivating the wheat S. Pastore fam. 14*). (pp. 396-400).

A description is presented of a new wheat Giovanni Giuliani, similar to S. Pastore in most characters but shorter in the straw and consequently less prone to lodge.

Landi, R. *Per la conservazione delle vecchie e nuove varietà*. (*For the conservation of the old and new varieties*). (pp. 401-02).

A plea is made for the conservation of germ-plasm in the form of varieties that have passed or are passing out of cultivation.

Grifoni, E. *Le varietà di frumento coltivate in Italia nel 1946-47*. (*The wheat varieties cultivated in Italy in 1946-47*). (pp. 415-26).

Statistical data are given showing the respective areas occupied by the 60 most important varieties and 134 other varieties, grouped as soft, hard, *T. turgidum* and spring wheats.

Maliani, C. *Nota descrittiva sul nuovo frumento "G. Giuliani" (autunnale, tenero, mutico, precoce)*. [*Descriptive note on the new wheat G. Giuliani (winter, soft, awnless and early)*]. (pp. 427-28).

The wheat in question originated from a spontaneous hybrid in S. Pastore, which it resembles except for the possession of stronger, shorter straw and hence greater standing capacity on rich land.

Trentin, A. *Lavori e sperimentazione in atto presso l'Istituto di Tecnica Agraria "Nazareno Strampelli"*. (*Work and experimentation in progress at the Nazareno Strampelli Institute of Agricultural Technology*). (pp. 429-37).

The above institute, situated at Lonigo in the Italian province of Vicenza, was founded in 1950 and officially opened at this meeting. An outline is given of the work now in progress, not only with wheat but with a number of other plants too.

- 2531 GUIOLET, J., HEINEN, A. & KOENIG, J. *Essais de variétés de céréales dans la région de l'Est Central*. (***Trials of varieties of cereals in the central part of the Eastern Region***). Bull. Tech. Ing. Serv. Agric. 1952 : No. 72 : 513-28.

The results of trials in France of the regional adaptation of large numbers of varieties of spring and winter wheat, oats, barley and

maize are set out in detail with comments on yields, winter hardiness, earliness, quality and resistance to diseases and lodging.

- 2532 LYSENKO, T. D. (***The tasks of the Lenin Academy of Agricultural Sciences in carrying out the resolutions of the 19th Party Congress, concerning the development of agriculture in the USSR***). *Agrobiologija* (Agrobiology) 1952 : No. 6 : 17-56. [Russian].

Some agrobiological questions are briefly referred to. A full account of the Mičurinite method of changing spring wheats into winter wheats (cf. Abst. 205) is included.

- 2533 KORNILOV, A. A. (***The most urgent task of plant physiologists***). *Selekcija i Semenovodstvo* (Breeding & Seed Growing) 1952 : No. 11 : 22-25. [Russian].

A detailed study of the external conditions, under which cereals will change into other varieties and forms, when sown for several generations in late autumn, is urged. In this connexion reference is made to Siberian experiments with the spring wheat Milturum 321. At Čeljabinsk, it produced mostly forms of the *erythrospermum* type and at Omsk of the *lutescens* type. Similarly, application of plant physiology to breeding cereals for productive ears and especially to determination of environments required for Mičurinite training of hybrid material is advocated.

- 2534 **1952 Report of the Grain Research Laboratory**. Ottawa 1953 : Pp. 88.

Information on the grain quality of new varieties and selections developed by Canadian breeders is reported in part III. Since the hard red spring wheats CT 708 (Thatcher x S 615) and CT 918 (Regent x Canus) had shown satisfactory qualities for at least three years, the results of final tests were considered in conjunction with their performance in different parts of Canada over several years; CT 708 was released for licensing as Chinook (cf. Abst. 991), and CT 918, also equalling the quality of Marquis, will probably be licensed next year, pending production of sufficient seed. The amber durum wheat DT 113 failed to show the superior macaroni quality for which it was selected the previous year (cf. PBA, Vol. XXII, Abst. 2573) and has been discarded. The hybrid malting barley U of M 43-1020 continued to

excel the malting quality of OAC 21 and seed has been multiplied with a view to release after final tests.

2535 CHEVALIER, R.

Les variétés de céréales d'hiver dans les régions méridionales (1947-1951). [**The varieties of winter cereals in the southern regions (1947-51)**].

Bull. Tech. Ing. Serv. Agric. 1952 : No. 72 : 561-71.

The regional adaptation of large numbers of French and other wheats in trials at Montpellier, Castelnau-dary and the upper Garonne is discussed on the basis of their performance records. Disease resistance received special attention. Similar, but very brief, information relating to oats and barley is also given.

2536 SCHAD, C., PLUMET, H., PAQUET, J. & BIDABE, B.

Expérimentation des céréales dans le Massif Central de 1949 à 1951. (**Testing of cereals in the Central Massif from 1949 to 1951**).

Bull. Tech. Ing. Serv. Agric. 1952 : No. 72 : 529-60.

Experiments on the suitability of large numbers of varieties of wheat, barley, oats and hybrid maize for the varied conditions of the Central Massif region of France are recorded in detail, with notes on yield, quality, earliness and resistance to diseases and lodging.

2537 GUYOT, L. & MASSENOT, M.

Observations et expérimentations sur la rouille noire des céréales au cours des années 1948 à 1950. (**Observations and experiments on black rust of cereals during the years 1948 to 1950**).

Ann. Inst. Nat. Rech. Agron., Paris 1952 : 2 : Sér. B : 507-23.

Further progress is reported on the black rust studies already referred to in Abst. 1835. Varietal reactions in field and laboratory are tabulated.

2538 SUNESON, C. A. & BERNARR, J.

Resistance reactions to the Hessian fly on the California-Mexico border. Agron. J. 1953 : 45 : 172-74.

Field trials of wheat and barley to assess varietal reaction to recently discovered populations of Hessian fly have been carried out in San Diego, Calif. The resistance of the locally adapted barley California Mariout equalled that of seven other varieties previously reported to be resistant in trials at Lafayette, Ind., and

Beltsville, Md., where California Mariout was susceptible (cf. *PBA*, Vol. XXII, Abst. 1930), thus distinguishing the insect biotype at San Diego from those at Lafayette and Beltsville. The distinctiveness of the Hessian fly biotype at San Diego was also indicated by the inadequacy of wheat genotypes with either H_1H_1 , H_2H_2 , or h_1h_1 , each of which gives resistance to races prevalent in northern California (cf. *PBA*, Vol. XX, Abst. 2266). Combination of H_1H_1 and H_2H_2 in a single genotype, however, as in Big Club 43, gave a high degree of resistance to all races of Hessian fly in California.

2539 WILLIAMS, J. H. (JUN.)

Crop variety response to exogenous growth regulators. II. Inheritance of differential response in corn and oats.

Iowa St. Coll. J. Sci. 1953 : 27 : 278-79.

Differential varietal responses to 2,4-D treatment at three early stages of growth were noted among 13 oat varieties.

Susceptibility to inhibition of root growth resulting from 2,4-D application showed partial dominance over tolerance in some crosses between inbred lines of maize. Data from F_3 and back-cross lines indicated that multiple factors were involved in controlling the response of the roots to 2,4-D, but that these factors were relatively few in number.

2540 PFEIFFER, R. & NEKY, E.

Ergebnisse der Getreideversuche des Jahres 1951/52. (**Results of cereal investigations for the year 1951/52**). VersErgebn. Bundesanst. alp. Landw., Admont 1953 : No. 20 : Pp. 47. (Mimeo-graphed).

These investigations showed that several new varieties, tested for the first time, were superior to existing varieties in yield or resistance to disease.

Spring wheat. The new varieties L1, L2 and L3 were tested for the first time and showed superior yields, together with complete immunity from black rust (*Puccinia graminis*) and brown rust (*P. triticea*) and average resistance to mildew (*Erysiphe graminis*). Their protein content was high.

The two new Weibull varieties 4808 and Kärn II [Kernel II] gave the heaviest yields, but were moderately susceptible to black rust.

Oats. The new varieties Firlbecks Gelb [Firlbeck's yellow] and Stammprüfung R, tested for the first time, produced the heaviest crops of the 20 varieties investigated. They were also more resistant to lodging.

Rye. The newly bred line W proved highly resistant to snow mould (*Fusarium nivale*) and to mildew (*E. graminis*), and the Alpine types Oberkärnter, Kefelmarkter and Tauernroggen again showed their superiority under bad climatic conditions to the normally more highly productive "intensive" varieties such as Petkus.

Spring barley. The Swedish varieties, Weibulls Herta and Weibulls Rika, again proved their superiority over all native varieties. The Admont investigations did not support the widely held view that they are inferior in brewing qualities.

The new Bavarian varieties, BJM 34, I 16-151, I 16-265, together with Weibulls 4468 and Weibulls Balda were comparable in yield to Herta and Rika. Whilst the Bavarian varieties showed considerably greater resistance to mildew (*E. graminis*), the Swedish varieties were more resistant to lodging.

2541 SMITH, W. E.

General variety tests.

Pr. Bull. Alberta Univ. Ext. Dep. 1952 : 37 : 6-9.

A report is given of investigations over a number of years into the varieties of wheat, oats, barley and flax most suitable for cultivation in Alberta.

2542 SKAARE, S.

Årsvekst og avling på Vidarshov 1952. (Crop production and yields at Vidarshov, 1952).

Samvirke 1952 : 47 : 500-03.

The yields obtained at the Vidarshov breeding station from various Norwegian varieties of wheat, oats and barley are listed with brief comments. The seed plots of potatoes also included a few Norwegian varieties while the root crops tested comprised Danish strains. Dry matter content and yield and the production of tops and roots are shown in a table.

2543 DIEHL, R.

Expérimentation sur les céréales dans la région de l'Ouest. Résultats relatifs à la période 1947-1951. (Experiments on cereals in the West Region. Results relating to the period 1947-51).

Bull. Tech. Ing. Serv. Agric. 1952 : 72 : 573-83.

This analysis, based on the results of trials at the Rennes Plant Breeding Station and on reports from agricultural schools in various departments of France, records the agricultural characteristics and suitability of the available varieties of wheat, barley, oats and maize from different districts of the West Region.

WHEAT

2544 BERMEJO ZUAZÚA, A.

Experiencia de variedades de trigos de primavera. (Segundo año: 1952). [Experiment with varieties of spring wheat. (Second year, 1952)].

An. Inst. Invest. Agron., Madr. 1953 : 2 : 63-73.

The variety Pinyte yielded more than all the other nine varieties tested. The differences were significant except in the case of Mentana, where it was almost so. Pinyte was also somewhat earlier than Mentana.

2545 SILVA, A. R. DA, HEIDRICH SOB., E. & LARDY, A. C.

Ensaio comparativos de trigo em Pelotas, Canguçu e Piratini. (Comparative tests of wheat in Pelotas, Canguçu and Piratini).

Agros, Rio Grande do Sul 1952 : 5 : 135-68.

Among the late wheats the best results have been given by Colonias, Patriarca, Trintecinco [Thirty-five] and some of its hybrids, and among the early wheats by Trapeano, Petiblanco and Frontana. Among the recent hybrids H-40-16-22 is promising.

2546 NICHOLSON, G.

Wheat varieties recommended for 1953 sowing.

Agric. Gaz. N.S.W. 1953 : 64 : Pt. I : 3-5, 42-47.

Varieties recommended for the different regions of New South Wales, and other wheats likely to be grown, are described in detail.

2547 ONUFRIJCHUK, T.

The production of speltoid mutants in spring wheat by X-irradiation.

Winnipeg 1953 : Pp. 20.

Exposure of moistened kernels to an X ray dose of 1500 r. was found to be the optimum treatment. Five X-ray-induced mutants of the wheat Redman and their behaviour in the X_1 , X_2 and X_3 are described in detail. Four are speltoids, numbered 15-2, 15-12, 33-3 and 35, respectively. Cytological analysis of 15-2 in the X_3 revealed that this mutant had 21 pairs of chromosomes + 1 isochromosome or 20 pairs + 3 isochromosomes. This irregularity, it is suggested, may be traced to a direct hit on the centromere of one chromosome during treatment, breaking the chromosome into two telocentrics, each with a functional centromere. In the production of 15-12 at least two reciprocal translocations had occurred, resulting in 17

bivalents and 2 chains of 4. Mutant 33-3 had square-shouldered awns, and was difficult to thresh; apparently it arose through gene alteration. Mutant 35 was notable for a fully bearded condition, in contrast to the short-tipped awns characterizing Redman. At least three reciprocal translocations were involved in its origin. Both normal and twin spikes were shown by the X_1 of the fifth mutant, 37, probably as a result of splitting of primordial cells of the embryo by the X rays. A genetically stable change affecting maturity had, however, also occurred, since X_2 and X_3 plants ripened several days earlier than the controls. Preliminary F_2 data from crosses between mutant 37 and late maturing wheats show that this earliness is dominant.

2548 PESOLA, V. A.

Kevätvehnän jalostustyöstä Jokioisissa. (Breeding work on spring wheat at Jokioinen).

Maatalous ja Koetoim. 1950 : 4 : 211-21.

A general review is given of spring wheat breeding carried out at the Jokioinen Agricultural Experimental Station over the last 20 years. The salient features of the more promising lines introduced are described.

2549 WAGNER, S.

Ergebnisse der Sortenversuche mit Winterweizen in den Jahren 1945-1948. (Results of variety tests with winter wheat in 1945-48).

Eidg. Landw. Versuchsanst., Zürich-Oerlikon : Pp. 14.

The results of these tests in Switzerland show that one line, 56-96, a selection from Trubilo x Plantahof, is equal to the standard variety Mont Calme 245 in yield and excels it in standing capacity; it is almost equal to it in earliness, and in milling and baking quality it surpasses the standard variety Plantahof 3. In view of this favourable combination of characters it has been released under the name Probus. It is less prone to foot rot than MC245 but seems less resistant to brown and yellow rust and to shedding.

2550 FERREIRA, A. DO N.

Melhoramento e experimentação de trigo—1952. (Breeding and experimentation with wheat in 1952).

Gaz. Agric. Moçamb. 1953 : 5 : 70-75.

An outline of the experimental work carried out in Moçambique shows Kenya Governor to be one of the best wheat varieties and it has been crossed with various others to correct certain slight defects.

Variety collections of barley and rye are under observation.

2551 MAREE, H. J.

New wheat varieties in the Highveld region.

Fmg in S. Afr. 1953 : 28 : 139-40.

The following new wheats have recently been produced by the Potchefstroom College of Agriculture: Maluti, Rooi Spitskop, Wit Spitskop, Gondveld, Penkop and Magaliesberg. The first three named are recommended as late varieties for the eastern Orange Free State; Wit Spitskop also gives good results in the north-western Orange Free State; Gondveld is recommended for the latter region as a variety with medium maturity. Penkop and Magaliesberg show promise as early wheats for the north-western region. The new varieties have not yet been tested for grazing purposes.

2552 THORPE, H. C.

A note on the release of new cereal varieties—IV.

E. Afr. Agric. J. 1953 : 18 : p. 99.

No. 321 BT.1.B.1., a new wheat variety developed and released by the Plant Breeding Station, Njoro, Kenya, is described. It was selected from a cross between Australian 45.C.5 and 117.A. It is a beardless, white chaffed, white grained variety, suitable for all areas of Kenya, and resistant to the physiological races of black stem rust K1 to K7, and K11, to orange leaf rust, and to yellow ear rust up to approximately 7000 ft. in Kenya. It is susceptible to K8 and K9, and tests with K10 and K12 are being made.

2553 VALDEYRON, G. & JACQUARD, P.

Enseignements techniques à tirer de la campagne de céréales 1951-52. (Technical information to be derived from the 1951-52 season for cereals).

Tunis. Agric. 1952 : 53 : 85-106.

Information is given regarding the way in which regional trials in Tunis are laid out, conducted and statistically evaluated. The hard wheats tested, with Florence x Aurore as control, included D 117 Mahmoudi x M'Rari, D 115 (Derbessi x Biskri) x M'Rari (cf. Abst. 1796) and the new selections TD 9-1 and TD 9-4.

Data regarding yield, quality and resistance to disease and lodging are discussed on the basis of performance in different localities. The TD 9 wheats were the best in quality, but TD 9-4 had to be eliminated owing to susceptibility to lodging. In trials conducted by the Cooperative Seed Corn Society (COSEM), D 117 Mahmoudi x M'Rari and D 115 (Derbessi x Biskri) x M'Rari

gave remarkably high yields and D111 (Psathos x Biskri) combined earliness with high quality and yield. Seed is now available of Hedba x Kahla; its yield and quality are good and it is resistant to lodging.

2554 WAGNER, S. & POPOW, G.

Ein neuer Sommerweizen im Richtsortiment des Schweizerischen Saatzuchtverbandes. (A new spring wheat in the variety list of the Swiss Seed Breeders' Association).

Mitt. schweiz. Landw. 1953 : 1 : 23-26.

A description is given of the performance of Lichti's Weihenstephaner früh [Lichti's Weihenstephan Early] spring wheat, which under Swiss conditions has surpassed Huron in earliness, yield and strength of straw, and equals it in quality; though it is less resistant to black stem rust than Huron, its losses in yield from that source are less owing to its earlier maturity, except in high altitudes.

2555 NAGAMATSU, T.

(The genetics of the winter habit in wheat).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : 28-29. (Abst.). [Japanese].

In connexion with Lysenko's theories on the inheritance of spring and winter habit in wheat, the author examined the frequencies of spring and winter types in the F_1 , F_2 and F_3 of numerous intervarietal crosses, the progenies being sown at various sowing dates, and thus exposed to different conditions in respect of temperature and photoperiod. A considerable difference in the proportion of spring to winter types was noted between samples sown at different dates.

2556 SACHS, L.

The occurrence of hybrid semilethals and the cytology of *Triticum Macha* and *Triticum Vavilovi*.

J. Agric. Sci. 1953 : 43 : 204-13.

Both at Cambridge, England, and Lund, Sweden, semilethal offspring which germinated well and became established as apparently normal seedlings, apart from reddish leaf colour, were produced by crossing strains 2 and 3 of *T. Macha* var. *subletshchumicum* with *T. Vavilovi* and other hexaploid *Triticum* spp. The semilethal condition is presumed to be dependent on the interaction of two genes designated m^a and m^b . The gene m^a is transmitted to hybrid progenies by *T. Macha* var. *subletshchumicum* 2 and 3, while other hexaploid species contribute m^b . Since no semilethal offspring were produced by interspecific crosses involving the hexaploid

T. Macha var. *subcolchicum*, this strain is thought to carry the genes mm . The occurrence of semilethals in progenies of *T. Macha* var. *subletshchumicum* crossed with *Aegilops cylindrica* ($2n = 28$) and with synthetic hexaploids ($2n = 42$), obtained by crossing *Ae. squarrosa* ($2n = 14$) with *T. dicoccoides* and *T. Timopheevi*, indicates that m^b is carried by both species of *Aegilops* as well as by some *Triticum* hexaploids. Thus the distribution of m^b supports the theory that the third chromosome set in *Triticum* hexaploids has been phylogenetically derived from *Ae. squarrosa* (cf. PBA, Vol. XVII, Abst. 166 and Vol. XXII, Abst. 253).

It is pointed out that the semilethal combination of genes exists between species with geographical distributions which do not overlap; this semilethal combination cannot therefore be a mechanism arising primarily to isolate two populations tending to overlap (cf. PBA, Vol. XIV, p. 83).

Cytological analysis of meiotic configurations in *T. Macha* and *T. Vavilovi* showed that the chromosomes of these species were differentiated to much the same extent as those of other hexaploid species of *Triticum*.

2557 MATSUMURA, S.

(Linkage studies in *Triticum* II. The P linkage group and the manifold effects of the P gene).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : 111-18. [Japanese].

Genetical analyses are reported of crosses between (*T. polonicum* x *T. Spelta*) x *T. polonicum* and (a) *T. dicoccoides* and (b) *T. persicum*. Long glume *vs.* short glume depended on the gene pair *P p*, awned *vs.* awnless on *a A*; hairy glume *vs.* glabrous glume on *Hg hg*; and red coleoptile *vs.* green coleoptile on *Rc rc*. *P* and *Rc* are linked, with a cross-over value of 20.3%. In addition to its primary effect, *PP* inhibits glume hairs and coleoptile and awn pigmentation.

Waxy *vs.* waxless depended on the gene pair *W w* and the inhibiting alleles *I_wi_w*. *W* and *I_w* are not linked with *P*, *A* or *Hg*.

The author discusses how far the pleiotropic action of *P* may be responsible for such phenomena as inhibiting segregation and genetic shift.

2558 MATSUMURA, S.

(The effects of the long glume gene in *Triticum polonicum*).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : p. 36. (Abst.). [Japanese].

Gene *P*, determining long glumes in *T. poloni-*

cum, also brings about long awns, hairy glumes, red coleoptile pigmentation and black hairs on the awns. It is linked with *Rc* (red coleoptile), with a cross-over value of 20.3%.

2559 VASIN, M. G.

(The accumulation of changes in the structure of the ear of spring wheat).

Agrobiologija (Agrobiology) 1953 : No. 1 : 3-16. [Russian].

Some promising forms of wheat with branching ears were obtained at the Baškirian Breeding Station by continuous selection of a hybrid between the nonbranching wheats Pioneerka [Pioneer] and Lutescens 53/12. The breeding work began at Kinelj, where an F_1 plant bearing an ear with two complementary glumes was selected. More extensive changes in the structure of the ears occurred in the F_2 and later generations. The changes were cumulative and heritable. The first plants producing branching ears were observed in the F_2 . Several lines, derived from the individuals with branching ears, showed as extensive a branching habit as the variety Vetrivistaja Kahetinskaja [Branching Kahetian]. The ears of the best selected lines are described. For instance, an average ear of the line 18-3-2a-4-25-2-1 produced 2.3 rachides, 32.1 spikelets and 36.1 grains. The weight was 46.8 grm. The new wheats showed resistance to fungous diseases and lodging. In crosses between the new forms and a local wheat Duvanskaja Krasnokoloska [Duvanskaja Red Ear] the branching habit was dominant over nonbranching.

2560 CICIN, N.

(Wheat-Agropyron hybrids).

Kolhoznoe Proizvodstvo (Collective Farming) 1953 : No. 4 : 56-57. [Russian].

New wheats developed at the Institute of Grain Farming of the Nonblack-earth Belt include the wheat-Agropyron hybrids 599, 186 and 1.

Hybrid 599 has productive ears and large grain and shows resistance to shedding, lodging and bunt. Its baking and milling properties are good and it yielded 41-44 c. per ha. in the Kaluga province. Hybrid 186 yielded 6.9 c. more grain per ha. than the winter standard in the Moscow province. It is interesting for its large grain, earliness, resistance to lodging and good baking and milling properties. Hybrid 1 is highly productive and resistant to lodging. In trials conducted in Latvia it yielded 63.3 c. per ha.

2561 FORLANI, R.

L'ibridazione interspecifica come mezzo di miglioramento del grano. (Inter-specific hybridization as a means of wheat improvement).

Ital. Agric. 1953 : 90 : 107-18.

Some segregates from a cross of Damiano x a branched *Triticum turgidum* are described and illustrated; certain of them are characterized by extreme fertility, having up to 8 grains per spikelet. Information is presented concerning the degree of success that can be expected from various interspecific combinations; *Aegilops ovata* has been crossed with all wheat species tried and with *Haynaldia villosa*, *Agropyron glaucum* and *A. elongatum*; Akagamughe [Akagamugi] wheat has given 80% success in crosses with rye, whereas Est x rye gave only one grain in 300 pollinations. In making difficult crosses the author has used a mixture of ears of a number of different varieties for pollinating and in this way increased the chances of success. Some promising hybrids for cultivation under unfavourable conditions have been obtained from crosses of Mentana x *Ae. ovata* followed by back crossing, and others from *Agropyron glaucum* show signs of being of interest.

Among the amphidiploids produced by the author, that of Est wheat x rye has given yields of grain equal to a late wheat, has tender leaves and young stems and high tillering capacity and might be of value as a forage plant. Those from tetraploid wheats x *T. monococcum* all have brittle rachis, as have those from *Ae. ovata* x tetraploid wheats. Possible lines of future breeding with distant hybrids are suggested.

2562 WAGNER, M. N. & MELLO-SAMPAYO, T. Nota acerca da movimentação dos univalentes em híbridos pentaploides de trigo. (Note on the movement of univalents in pentaploid wheat hybrids).

Broteria, Lisboa 1950 : 18 : 180-87.

Meiosis is described in four crosses involving different varieties of *Triticum vulgare* on the one hand, and *T. durum* on the other. The C univalents segregated at random at anaphase II with the formation of gametes with 14, 21 and intermediate chromosome numbers.

2563 FORLANI, R.

Proposta di revisione delle specie del genere *Triticum*. (Proposal for a revision of the species of the genus *Triticum*).

Sympos. Genet. Pavia 1952 : 3 : 402-08.

It is pointed out that *T. Timopheevi*, having the

genomes AG, is more distinct than the other tetraploid species, and that *T. dicoccoides* exists in two forms, var. *syrio-palestinense* and var. *armeniicum*, the former of which crosses well with other tetraploid species while the latter does not; only the latter is regarded as meriting specific rank and the name *T. armenicum* is proposed for it. All the other tetraploid wheats with the exception of *T. Timopheevi* should be relegated to subspecies; similar changes are proposed for the diploid and hexaploid groups.

2564 SANCHEZ-MONGE PARELLADA, E.

Los triticales. (*Triticale*).

Rev. Inst. Agric. Catal. 1952 : 101 : 101-04.

Various forms of *Triticale* tested at the Aula Dei experimental station at Zaragoza, Spain, proved highly susceptible to black stem rust, late in maturity and low in yield. Attempts are being made to produce a *Triticale* with lower chromosome number by using *Triticum durum*, and 18 varieties of this species have been pollinated with rye pollen. Only three plants were obtained from 5504 pollinations and these are being treated with colchicine.

2565 TOTU [TOTSU], T.

(Crossability between wheat and rye).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : 90-95. [Japanese].

Numerous crosses were attempted between 27 Japanese varieties of *Triticum vulgare*, used as mother plants, on the one hand, and 6 varieties of rye, used as pollinators, on the other. Seed set varied from 2.1 to 66.3% according to the variety of the mother plant. Varietal differences in seed set due to the paternal parent were not observed.

2566 SASAKI, M.

(A twin plant that appeared in the cross, common wheat x rye).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : p. 24. (Abst.). [Japanese].

A twin plant was observed in a cross between the variety Hiraki of *Triticum vulgare* and Petoriza rye. One component was a wheat haploid (genome ABD) which formed 0-6 bivalents at meiosis, with the mode at 0. The other component was a normal hybrid (genome ABDR), which formed 0-4 bivalents at meiosis, with the mode at 2.

2567 KIHARA, H. ET AL.

(Five types of allohexaploids obtained from Emmer wheat x *Aegilops*).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : 22-23. (Abst.). [Japanese].

F₁ hybrids were obtained by crossing varieties

of *Triticum dicoccoides*, *T. durum*, *T. orientale*, *T. persicum* and *T. turgidum* on the one hand and *Ae. squarrosa* on the other. In general, sterility in the hybrids was high, with numerous univalents at meiosis. Some F₂ plants were obtained however, and some plants derived from *T. persicum* x *Ae. squarrosa* were found to have 42 chromosomes (21_{II}, 20_{II} + 2_I or 19_{II} + 4_I) at meiosis. These forms bore various resemblances to *T. vulgare* and may help to throw light on its origin.

2568 NAKAJIMA, G.

[Genetical and cytological studies on the breeding of amphidiploid types between wheat and rye. I. The external characters and chromosomes of the fertile F₁ of *Triticum turgidum*, n = 14, and rye (*S. cereale*, n = 7) and of the F₂.]

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : 139-48. [Japanese].

An extended version is given of the article summarized in PBA, Vol. XX, Abst. 2231.

2569 TRUHIKOVA, A. T.

(The importance of the sowing dates for changing spring wheat into winter wheat).

Agrobiologija (Agrobiology) 1953 : No. 1 : 50-55. [Russian].

At Moscow, the spring wheat Milturum 321 acquired a winter habit in two seasons, when its second generation was sown not later than on 31 August.

2570 LARIČEVA, M. D.

(The productiveness of hybrids in relation to the external training of their parental forms).

Selekcija i Semenovodstvo (Breeding & Seed Growing) 1953 : No. 1 : 10-21. [Russian].

At the Timirjazev Agricultural Academy, the F₁ between some spring wheats showed more extensive heterosis when the maternal plants were grown under external conditions different from those of the paternal forms during the year in which the crosses were made, or the previous year. The hybrids were obtained from crosses involving Lutescens 62 as female parent, with Sarrubra, Erythrospermum 841, Milturum 321 and Caesium 111 respectively as the pollen parents. The F₁ of Lutescens 62 x Mosgibrid 48 [Moscow Hybrid 48], Erythrospermum 841 x Lutescens 1935/1 and Caesium 111 x Marquis bore more productive tillers when the parental forms varied in respect of their origins.

2571 PALMER, T. P.

Progressive improvement in self-fertilised crops.

Heredity 1953 : 7 : 127-29.

Since a large number of genes generally determines the expression of most quantitative characters in wheat, and numerous genes segregate in any particular cross, a completely homozygous genotype with an optimum quantitative expression occurs rarely in the F_2 . It is, however, unlikely that promising lines, carrying several homozygous gene pairs, will contain the same desirable genes. Crosses between high yielding selections will therefore produce more successful combinations than the original F_2 or subsequent unselected progenies. As good results may be obtained from relatively small populations, such a programme might prove a useful adjunct to breeding for improved characters.

2572 SACHS, L.

Chromosome behaviour in species hybrids with *Triticum Timopheevi*.

Heredity 1953 : 7 : 49-58.

An analysis of chromosome pairing at metaphase I in F_1 hybrids of *T. Timopheevi* ($2n = 28$) crossed with other $4x$ species shows that at least some bivalents are formed in all crosses. Greatest similarity was shown between chromosome complements of *T. dicoccoides* var. *nudiglumis* and *T. Timopheevi*; meiosis was apparently regular and normal tetrads were formed, but these subsequently degenerated and the anthers remained undehisced. This sterility may be due to recombination between chromosomes containing nonhomologous segments, whose cryptic structural hybridity does not affect metaphase pairing. The colchicine-induced amphidiploid ($2n = 56$) of this $4x$ hybrid was, however, fertile. On the basis of chromosome behaviour at metaphase *T. dicoccoides* var. *nudiglumis* would be assigned the AG genomic formula of *T. Timopheevi*, according to Sears (cf. *PBA*, Vol. XVIII, Abst. 2172); on the other hand, the closely related *T. dicoccoides* var. *kotschyannum*, whose hybrid with *T. Timopheevi* produces fewer metaphase bivalents, would presumably have an AB genome, characteristic of tetraploids other than *T. Timopheevi*. Since it is improbable that these two varieties of *T. dicoccoides* are phylogenetically derived from different species, the inadvisability of assigning genomic formulae merely on the basis of metaphase configurations is apparent. As the two varieties of *T. dicoccoides* show considerable diversities in chromosomal structure,

T. Timopheevi may also have diverged from a $4x$ prototype; in fact, all $4x$ species of *Triticum* may be derived from the same 28-chromosome prototype.

2573 BIANCHI, A. & FORLANI, R.

Una nuova forma di *Aegilops ovata* L. (A new form of *Ae. ovata* L.).

Sympos. Genet. Pavia 1952 : 3 : 394-401.

An aberrant form which appeared in a population of *Ae. ovata* is described. It is distinguished by 1-2 fertile spikelets and 1-2 sterile spikelets in excess of the normal number for the species, 2-3 awns instead of 4-6, larger stomata, anthers and pollen grains, later anthesis, larger kernels and higher germination capacity at low temperatures. Its chromosome number proved to be 42 as opposed to 28 in the normal members of the species.

2574 FORLANI, R.

Osservazioni su alcuni allopoliploidi artificiali con particolare riguardo alla grandezza dei grani di polline. (Observations on some artificial allopolyploids with particular reference to the size of pollen grains).

Genet. Agr. 1953 : 3 : 264-72.

Numerous cases are mentioned of polyploid species whose dimensions are not greater than those of the diploid parents; often only certain organs, such as the pollen grains, are larger. Measurements made on a number of members of the Triticineae showed that the average pollen grain diameter in the diploid species of *Triticum* was 45.83μ , in the tetraploid 50.44μ and in the hexaploid 58.87μ ; however the pollen in tetraploid species of *Aegilops* was smaller than in diploid species of *Triticum* and *Secale*. Artificial hexaploids of *T. vulgare* x *T. monococcum* were similar in pollen size to the natural hexaploid species, while the octoploid synthetics varied according to the parents, *Triticale* having larger pollen than the hexaploids and *Aegilotriticum* having pollen about equal to the hexaploids.

It is pointed out that considerable segregation occurs in artificial amphidiploids between tetraploid wheats and *T. monococcum*, and of *Ae. ovata* x *T. dicoccum*, which would indicate a certain degree of homology between *Ae. ovata* and the *Triticum* genomes.

The fertility of the *Triticale* amphidiploids varied, according to the wheat parent used and also from plant to plant, but no segregation of characters was observed.

2575 TARAKANOV, K. N.

(Embryonic changes observed in the somatic tissues of hard wheat).

Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1953 : No. 1 : 66-70. [Russian].

Dividing cells of radicles of *Hordeiforme* 10, which was trained upon acid substrates for three generations, had 42 or 35 chromosomes instead of the normal 28. Portions of some grains of the experimental plants were white and had a different consistency from that of the grain of hard wheats. The grains produced by the experimental plants germinated more readily upon acid substrates than those of the controls.

2576 VALLE, O.

Kevätvehnän siemenen turvaaminen keväällä 1953. **(Preserving spring wheat seed for the spring of 1953).**

Koetoiminta ja Käytäntö 1952 : 9 : No. 12 : p. 2.

Comparative data were collected during the autumn of 1952 on the germination capacity and maturation of the current season's spring wheat varieties. Germination capacity was studied in relation to time of sowing, time of threshing and humidity during the storage period.

2577 SCHMALZ, H.

Entwicklungsphysiologische Untersuchungen am Saatweizen *Triticum aestivum* L., insbesondere über die Bedeutung der photoperiodischen Veranlagung für die Ausbildung der Sortencharaktere. **(Studies in developmental physiology with bread wheat, *T. aestivum* L., particularly regarding the importance of photoperiodic constitution for the expression of varietal characters).**

Z. Pflanzenz. 1953 : 32 : 27-28.

A large collection of wheat varieties from different European countries was examined in respect of growing habit and development of the ear primordia. Clear differences in type were observed between the winter wheats from different latitudes, those from northern countries being more procumbent in the early growth phases and later in the development of the ear primordia. Typical representatives of the northern and southern types were treated with photoperiods of 24, 16 and 12 hours at a temperature of $\pm 30^{\circ}\text{C}$; the primordia of the northern group failed to develop in the 16 hour day, whereas those of the southern group were as advanced as in the continuous light. Similar results were obtained after previous vernalization; also by sowing in the open in mid-July, by

transferring plants grown outside during the winter to 16-hour and 24-hour days in the greenhouse in the spring, and by comparing the growth in the greenhouse under normal and under 13-hour day. A positive correlation was observed between winter hardiness and the procumbent growth form of the northern types, which were characterized by significantly higher tillering capacity, later earing and greater number of spikelets per ear.

Observations on spring wheats showed that they too differed in their photoperiodic response, some varieties being more retarded by a 12-hour day than others.

The origin of these photoperiodic differences is ascribed to a series of mutations for long-day requirement, enabling the mutant forms to spread gradually from the centre of origin of the species to more northerly latitudes. In support of this view reference is made to two X-ray mutants of Heines IV winter wheat which when sown on 12 May ripened by 21 Aug., while the remaining 1198 plants of the population failed to ear; the mutants proved to be only slightly above a typical spring wheat in their vernalization requirements.

Subsidiary illumination of $3\frac{1}{2}$ hrs. over and above the normal daylight caused an acceleration in development of the ear primordia and an associated reduction in winter hardiness in most wheat plants; those which did not show such a reaction were selected as breeding material for winter hardiness.

Very few truly alternative wheats occurred but Heines Peko showed a strong approximation, being a long-day variety with very low vernalization requirements.

2578 ŠESTAKOV, V. E.

(Intervarietal hybrids of winter wheat obtained by open pollination).

Selekcija i Semenovodstvo (Breeding & Seed Growing) 1952 : No. 12 : 7-12. [Russian].

At the Petrovskaja Breeding Station, Rye-wheat Hybrid 46/131, Petrovskaja 7 and Penzenskaja Morozostoikaja [Penza Frost-resistant] were open-pollinated with several wheats including Odessa 3, Odessa 12, *Erythrosperrum* 529, *Lutescens* 17 and *Hostianum* 2827 and 2836. The F_1 from crosses involving Rye-Wheat Hybrid 46/131 or Petrovskaja 7 gave a higher percentage of viable seed and bore more productive tillers and grains per plant than the maternal parents. The 1000 kernel weights of the hybrids were also higher. The F_1 derived from Petrovskaja 7 resembled its female parent,

but that obtained from pollination of Rye-Wheat Hybrid 46/131 gave 73.3% segregates in respect of ear characters. These comprised 45.5% ears of the *lutescens* type, 3.4% *velutinum*, 19.1% *hostianum* and 5.3% *millurum*.

The F₁ of Penzenskaja Morozostoikaja gave 90.1% of the maternal type and 9.9% *velutinum* plants. The effects of intervarietal open pollination upon economic properties of Penzenskaja Morozostoikaja were negative in all but one respect: the 1000 seed weight of the F₁ hybrids was a little higher than that of the initial variety.

2579 YAMADA, T.

(Studies on the genetics of the tendency towards the prostrate habit in wheat and on the relation between this feature and the most important characters of the plant. II. On the relation between the tendency towards the prostrate habit and the most important characters of the plant, in particular, maturation period).

Ikushugaku Zasshi/Japan. J. Breeding 1952 : 1 : 201-09. [Japanese].

Studies are reported on correlations observed between the habit of the juvenile plant, whether procumbent or erect, and various adult characters, in the F₂-F₄ of Hokuriku 13 x Saitama 27. Using a scale of 16 for the series procumbent-erect, a strong correlation was detected between juvenile habit and length of heading and flowering period, and a weaker correlation between juvenile habit and number of tillers, tendency towards shattering, and length of awn. The correlation with vegetative period depended primarily on the readiness with which the plants responded to vernalizing conditions.

2580 IRVINE, G. N. & ANDERSON, J. A.

Note on the lipoxidase activity of various North American wheats.

Cereal Chem. 1953 : 30 : 255-57.

The relative lipoxidase activities of 16 varieties were determined at the Grain Research Laboratory, Winnipeg, Canada. The results suggest that the red wheats, comprising hard spring and winter wheats and soft winter varieties, have as a class higher activities than the white wheats and newer amber durum varieties.

2581 VEIJOLA, T.

Eräistä uusista vehnäjalosteista ja niiden leivontakelpoisuudesta. (New items from wheat breeding and their baking qualities).

Maatalous ja Koetoin. 1950 : 4 : 184-99

A review of wheat breeding in Finland over the

last 20 years and of foreign varieties cultivated there is given, with a comparison of the hectolitre weight and baking qualities of the more important varieties.

2582 THROCKMORTON, R. I.

Reminiscence of varietal changes in Kansas wheat and their relation to wheat quality.

Trans. Amer. Ass. Cereal Chem. 1953 : 2 : 13-19.

The continual replacement of once-popular wheats by improved varieties bred for conditions in Kansas is traced during the last thirty years, emphasizing the attention given to the selection of varieties with flour quality suitable for specific uses.

2583 YAMAZAKI, W. T.

An alkaline water retention capacity test for the evaluation of cookie baking potentialities of soft winter wheat flours.

Cereal Chem. 1953 : 30 : 242-46.

An alkaline water retention capacity test suitable for intervarietal comparisons of biscuit-making quality is described. The results of the test may be compared directly with biscuit diameter, without the necessity of adjustment for protein and ash content, as in the use of other physiochemical methods.

2584 SEEBORG, E. F.

Evaluation of wheat milling characteristics by laboratory methods.

Trans. Amer. Ass. Cereal Chem. 1953 : 2 : 1-5.

At the Western Wheat Quality Laboratory, Pullman, Wash., a composite formula has been devised for evaluating small samples of grain on the basis of optimum rate of milling, optimum moisture content, total flour yield, percentage of high quality flour and ash content of flour. Using this formula, experimental milling will provide a more reliable estimate of the quality of selections from current breeding programmes than analysis of either of the component factors alone.

2585 ELDER, A. H., LUBISICH, T. M. & MECHAM, D. K.

Studies on the relation of the pentosans extracted by mild acid treatments to milling properties of Pacific Northwest wheat varieties.

Cereal Chem. 1953 : 30 : 103-14.

Analysis of the pentosan content of different milling fractions of four wheats has revealed a

negative correlation between the pentosan percentage, indicative of endosperm cell wall composition, and milling quality. A full description of this method of evaluating flour quality is provided for breeders working with small samples.

2586 FOKEEV, P. M.

(Cereal plants for cultivation under irrigation).

Selekcija i Semenovodstvo (Breeding & Seed Growing) 1953 : No. 1 : 56-69. [Russian].

Several spring and winter wheats adapted to cultivation under irrigation in the Astrahanj, Kuibyshev and Saratov provinces, Kazakhstan and Kirgizia are listed. Reference is made to promising new wheats which show a higher degree of resistance to rust and lodging than some standards. The millets Krasnyi Kut 48 and Ural 1419 are named as new standards for cultivation on irrigated lands in the Saratov or Astrahanj province respectively.

2587 PRUCKOVA, M. G.

(Varieties of winter wheat for cultivation under irrigation).

Selekcija i Semenovodstvo (Breeding & Seed Growing) 1952 : No. 11 : 41-49. [Russian].

The State Commission for Varietal Trials has certified many varieties as standards for cultivation on irrigated lands in the arid southern provinces of Russia or in the Northern Caucasus. Most of them are productive, show resistance to drought, lodging and brown rust and have good baking and milling properties. Erythrospermum 118, Odessa 3 and Uljanovka, which have been made standards in the Volga Basin, proved hardy.

2588 MAYER, R., JONARD, P., DE FOSSEUX, G., DE CUREL, B. & GUIMBARD, C.

Comportement en champs d'essais, des principales variétés de blé cultivées dans la Région Parisienne, la Normandie, le Nord et le Nord-Est de la France. **(Behaviour in experimental plots of the principal varieties of wheat grown in the Paris region, Normandy, the North and the Northeast of France).**

Bull. Tech. Ing. Serv. Agric. 1952 : No. 72 : 471-507.

Extensive tabular data for 1938-51 relating to yield, quality, earliness and resistance to cold and diseases are analysed to ascertain the

suitability of large numbers of French wheats for different types of soils in various regions of France.

2589 JAKUBCINER, M. M.

(New standard varieties of wheat and their identification).

Selekcija i Semenovodstvo (Breeding & Seed Growing) 1952 : No. 11 : 49-56. [Russian].

Principles for identifying recent Soviet wheat standards, including many land varieties and some material adapted to cultivation in new districts, are outlined. The economic properties of some of these wheats are described and details of their origins are given. Of the new winter wheats showing resistance to lodging, Lutescens 230 and Leninakan are tolerant of cold and drought, Zenitka shows immunity to diseases, Krasnodar 131 is notable for resistance to shedding, Wheat-*Agropyron* Hybrid 1 produces squarehead type ears with large grain, and Skorospelka L-1 [Early L-1] is early and bears productive cylindrical ears.

The new spring standards include: Irkutsk 49, an early variety, which produces firm straw; Omsk 2078, notable for its short growth period; Šortandinka, which has a vigorous root system and reaches maturity early; Dubljanskaja 4, interesting for its thick firm straw, and Čakinskaja 226, a hard wheat producing compact ears.

2590 ZDRILJKO, A. F. & DELONE, L. N.

(Trials of winter wheat varieties under irrigation).

Selekcija i Semenovodstvo (Breeding & Seed Growing) 1953 : No. 1 : 69-75. [Russian].

Uncertified winter wheats Voshod 21 [Sunrise 21], Lutescens 17 and Harjkov 4 showed a high degree of resistance to lodging and surpassed all others in yield in the irrigation trials conducted at the Brilevskaja research station. Voshod 21, bred at Verhjačka, yielded 56.8-58.0 c. per ha. It had tall plants bearing productive ears with large grain. Lutescens 17, developed at the same institute, bore larger grain than Voshod 21, but in yield fell a little behind it. Harjkov 4, bred at the Genetics Institute of the Ukrainian Academy of Sciences, was interesting for its good tillering capacity, but in respect of its yielding capacity it was intermediate between the other two wheats and in respect of the 1000 seed weight it took the last place.

Odessa 3, Odessa 12, Odessa 16 and Hostianum 181 are mentioned as having shown resistance to rust.

- 2591 Kouderesistentie en koudebehoefte van tarwerassen. 1ste rapport van de werkgroep voor kouderesistentieonderzoek. (**Cold resistance and cold requirements of varieties of wheat. First report of the working committee on research on cold resistance**). Tech. Ber. Stichting Coörd. Cult. Onderz. Broodgraan 1952 : No. 5 : Pp. 78. (Mimeographed).

This report of the above mentioned committee, set up in 1950 to investigate cold resistance, is concerned with the wheats of western Europe. Records were also collected of their resistance to black and yellow rust.

Wittenrood and Broekhuizen record trials in 1951 on the cold resistance of various wheats. Dantuma contributes papers on cold resistance determination; on the cold requirements of varieties in relation to sowing time; on cold resistance and cold requirement; and on the relation between 1000 corn weight and sowing time. Wittenrood also studied cold resistance and cold requirements in relation to the morphology of the plant. Feekes investigated the value of sowing time experiments in breeding operations, with particular reference to rust resistance; and van de Sande Bakhuyzen made a preliminary study of the relations between cold resistance, vernalization and hardening.

- 2592 VON BAER, E.
Los trigos de rulo en la zona central. (**Dry-farming wheats in the central zone**). Campesino, Santiago 1953 : 85 : No. 2 : 8-10.

Three years' observations in Chile showed the variety Menflo to be the best in respect of resistance to *Puccinia glumarum*, yield and standing capacity when grown without irrigation.

- 2593 THOMAS, I. & REEVES, J.
New cereal varieties in Australia.
J. Dep. Agric. W. Aust. 1953 : 2 : 213-14.

The new wheat variety Saga (Pusa IV x Gunnedah 3 x Gabo) has the grain characteristics of Pusa IV, has been placed in the strong to medium-strong class, and its straw is of medium height and moderately strong.

Saga matures early, is resistant to flag smut, stem rust races 126 and 126B, and moderately resistant to leaf rust races 26 and 95. It is susceptible to the new Australian stem rust complex and to leaf rust races 135 and 138.

Sabre [Gabo x (Nabawa x Dan x Dundee) x (Dundee x Kenya C. 6042)] is a midseason

wheat, and is resistant to flag smut and to stem rust races 126 and 126B, but susceptible to leaf rust.

Reldep (Ghurka x Dan) is also a midseason wheat, is resistant to flag smut but not to stem rust, and the medium to coarse white strong straw is of medium height.

Descriptions are also given of the wheat variety Spica and the flax Boyup (cf. Abst. 249 and 2082).

- 2594 CONNERS, I. L.
International wheat rust conference.
Plant Prot. Bull. 1953 : 1 : 85-86.

A wheat rust conference organized by the Department of Agriculture of Canada was held in January 1953 at Winnipeg, and was attended by delegates from Canada, the United States, Mexico and Colombia. Among the topics discussed were biotypes of stem rust and breeding for rust resistance, reference being made to the scheme arranged by the US Department of Agriculture in cooperation with Canada and several Latin American countries so that new selections and varieties can be tested under a wide range of conditions in these countries.

- 2595 HASSEBRAUK, K.
Die physiologische Spezialisierung des Weizenbraunrostes *Puccinia triticea* Erikss. in der Deutschen Bundesrepublik während der Jahre 1950/51. [**The physiological specialization of brown rust (*P. triticea*) in wheat in the German Federal Republic during 1950/51**].
Z. Pflanzenz. 1953 : 32 : 132-36.

Investigations during 1951 and 1952 showed that a considerable change has occurred in the strain spectrum of brown rust in wheat in Western Germany. Strain 1 (=UN 1) is now the most prevalent strain, whilst strain 11 (=UN 10) appeared only sporadically, and no cases of strains 14, 15 and 20 (=UN 13) were reported.

- 2596 GOKHALE, V. P. & PATIL, B. P.
Occurrence of a new race (No. 122) of *Puccinia graminis Tritici* in Bombay State.
Curr. Sci. 1952 : 21 : p. 250.

The new race has been designated 122, on the basis of the reactions of the 12 differential wheats proposed by Stakman *et al.* (cf. *PBA*, Vol. XV, Abst. 1381). Charter, Gabo and

Gaza are among the few wheats showing resistance.

2597 SCHMIDT, J. W. & HEYNE, E. G.

A new wheat breeding frontier.

What's New Crops Soils 1953 : 5 : No. 8 : 12-13.

Progress made at Kansas State College in the development of wheat x wheatgrass hybrids which resemble wheat but incorporate the rust resistance of *Agropyron* is briefly reviewed. Wheat-like lines with resistance to 8 races of stem rust, including 15B, have been obtained. A number of intergeneric hybrids were also immune from attacks by joint worm.

2598 LUČIĆ, S.

Ispitivanja otpornosti nekih linija pšenice na smeđu i crnu rđu. (**Testing the resistance of some lines of wheat to leaf and stem rusts**).

Zaštita Bilja (Plant Protection), Beograd 1953 : No. 15 : 28-36.

The results of the trials have been previously reported in Abst. 1789.

2599 AFIFI, A.

Production of rust resistant *vulgare* wheats by backcrossing. III.

Bull. Roy. Agric. Soc., Egypt 1953 : Tech. Sect. No. 41 : Pp. 36.

During the 1951-1952 season, true-breeding progeny of (Mokhtar x Giza 139) x Giza 139 continued to excel all other hybrids of Egyptian origin in respect of rust resistance and yielding ability (cf. *PBA*, Vol. XXII, Abst. 2625). The family has been bulked with a view to release as a commercial variety. Three other families developed by back-crossing F_1 hybrids of local origin also proved rust resistant. Two of these, [(Giza 4 x Maarad) x Giza] x Giza and [(Giza 4 x Maarad) x Mokhtar] x Mokhtar, were homozygous for pubescent glumes. The third family, (Tousson x Mokhtar) x Mokhtar, included some desirable individuals, indistinguishable from Tousson apart from their high degree of rust resistance; these individuals have been selected. Several progenies from multiple crosses between Egyptian wheats are already showing new combinations of morphological characters and rust reaction, having reached a sufficiently heterozygous state for simultaneous segregation of numerous factors. A wide range of variability was also found in the F_1 of crosses in which local wheats were pollinated by selected introductions with rust resistance. Both Newthatch and a hexaploid derivative of *Triticum*

Timopheevi from Kenya transmitted dominant genes for rust resistance to all their hybrid progenies. Promising selections were obtained from crosses between Tousson and the *T. Timopheevi* derivative.

2600 VINCENT, A., PONCHET, J. & KOLLER, J. Recherche de variétés de blés tendres peu sensibles au piétin-verse: résultats préliminaires. (**Seeking varieties of soft wheats only slightly susceptible to lodging due to footrot: preliminary results**).

Ann. Inst. Nat. Rech. Agron., Paris 1952 : 2 : Sér. B : 459-72.

This report on the investigation undertaken in 1951 by the National Centre for Agronomic Research, Versailles, includes: (1) information on methods of classing the affected plots; and (2) some preliminary results on the reaction of soft wheats, grown in France, to *Cercospora herpotrichoides* as a cause of lodging.

2601 Forsøg med hvedesorter 1947-51. (**Trials with wheat varieties 1947-51**). Tidsskr. Planteavl 1953 : 56 : 341-44.

Wheat trials at nine Danish experimental stations are recorded. Jubilé gave the highest grain yield, 46.9 hkg. per ha., and next came Pajbjerg Konge II [Pajbjerg King II], Weibulls Eroica, Trifolium 37/1167 and Svalöf Hansa in that order. From observations in 1947 only, Eroica and Hansa seemed the most winter hardy, and Pajbjerg Konge II and Jubilé the least so. Jubilé and Svalöf Skandia III B had the stiffest straw.

In preliminary tests in 1950 and 1951 at three stations, Alba and Nord Desprez both surpassed Jubilé in grain yield.

2602 La Station Expérimentale Agricole Régionale de Sétif. (**The Regional Agricultural Experimental Station of Sétif**).

Serv. Exp. Agric. Algérie 1952 : Pp. 16.

An account is given of the establishment, organization and development of the above station in Algeria. Work during 1936-52 was concerned mainly with studies on cereals, forage crops, potatoes, sugar beet, sunflower, soya bean, lentils, artichoke, sweet potato, sweet sorghum, tobacco and, since 1950, hybrid maize.

In a brief note on the results obtained, the superiority of the soft wheat variety Mahon Demas and of the maize hybrids as compared with indigenous maize is recorded.

- 2603 DONOVAN, P. A.
Report on the summer wheat trials carried out on the Gwebi Agricultural College Farm, 1951-1952.
 Rhod. Agric. J. 1953 : 50 : 46-53.

Data are presented on the relative adaptability of three Kenya introductions, 318 AJ, 360 H and Kenya Settler, to conditions at Gwebi, Southern Rhodesia.

- 2604 THOMAS, I. & REEVES, J.
Wheat variety trials on research stations, 1952.

J. Dep. Agric. W. Aust. 1953 : 2 : 201-11.

Tabulated data are presented on the grain quality and resistance to flag smut and stem rust of varieties under trial in Western Australia. Yields of the new varieties Javelin 48 and Panther proved somewhat disappointing in first tests, and these varieties are to be retested in 1953. In first year trials at the Merredin Research Station the new hybrids M107, M108, M109 (Kenya C.6041 x Eureka 11) and M 112 [M61 (Sword x Kenya C.6041) x Eureka 11] have produced somewhat disappointing yields.

BUCKWHEAT

- 2605 ESSER, K.
 Genomverdopplung und Pollenschlauchwachstum bei Heterostylen. (**Genome duplication and pollen tube growth in heterostylous plants**).
 Z. induct. Abstamm.- u. VererbLehre 1953 : 85 : 28-50.

Diploid plants of *Lythrum Salicaria* gave only 1-2% set of capsules from illegitimate pollinations, and the pollen tube failed to penetrate the style as far as the ovule; this sterility was not removed by application of boric acid or extracts from style or pollen; however, in long and medium-styled plants higher sets were obtained from illegitimate pollinations performed on immature styles.

Tetraploid plants gave good sets of capsules after legitimate pollination, though the number of seeds was about one third less than in the diploids. Illegitimate pollinations of long and medium-styled tetraploid plants were again sterile, but when diploid plants were pollinated with illegitimate pollen from tetraploids a certain amount of seed was set; this did not occur with short-styled plants. When tetraploid plants were pollinated with diploids, the set was only 30-50% in legitimate pollinations and nil in illegitimate. A semihomomorphic tetraploid form in which the style and the long anthers were roughly the same length behaved

in exactly the same way as the tetraploid medium-styled plants, showing that the sterility in illegitimate pollinations is not merely a function of the relative length of style and anthers.

In *Fagopyrum esculentum*, legitimate pollinations gave a set of 90-95% in diploid plants and 37-40% in tetraploid; illegitimate pollinations gave only 1-3% set in both, though self pollen tubes grew further down the style in the tetraploids than in the diploids. Diploid plants pollinated with legitimate pollen from tetraploids gave sets of 10-20% and with illegitimate pollen, 9% in the long-styled and 1% in the short-styled plants. Only 2-4% set resulted from legitimate pollinations of tetraploid x diploid plants, and none at all in illegitimate. A homomorphic form that occurred in the tetraploid progenies was self fertile and in combinations with other plants behaved as a long-styled type; another, which was self sterile, proved to be genetically short-styled, and a third was genetically long-styled but its style was still further reduced in length and it was fertile in all combinations.

The above results are not compatible with an interpretation based on inhibiting substances in the pollen and the interpretation given is that the pollen carries antigens which are determined by the genetic constitution of the sporophyte and react with the antibodies of the style, there being two of each in *Fagopyrum* and three of each in *Lythrum*, the strength of the antibody system increasing progressively from long, medium to short styles.

OATS

- 2606 HUTTUNEN, E.
 Sisukaura. (**Sisu oats**).
 Maatalous ja Koetoim. 1950 : 4 : 60-67.

A description is given of the Sisu oat referred to in *PBA*, Vol. XXII, Abst. 1832.

- 2607 POEHLMAN, J. M.
0-200, a new, early variety of oats for Missouri.
 Bull. Mo. Agric. Exp. Sta. 1949 : No. 534 : Pp. 15.

The red oat variety 0-200 has been selected from the cross Columbia x Bond-Iogold. It has inherited earliness, vigour and tallness from Columbia, and resistance to loose and covered smut, crown rust, stem rust and Victoria blight from Bond-Iogold. On the average it has out-yielded Columbia by 6.3 bushels per acre. Its test weight is particularly high, the average bushel weight being 33.0 lb. The variety is

best adapted to soils with medium fertility in central and southern Missouri.

2608 SILVA, A. R. DA.

Comportamento de variedades de aveia em Curitiba de 1941 a 1946. (**Behaviour of oat varieties at Curitiba in 1941-46**).

Bol. Téc. Inst. Agron. Sul 1948 : No. 3 : Pp. 26.

A wide range of material, including forms of *Avena sativa*, *A. byzantina*, *A. orientalis* and *A. nuda*, has been studied and data are given regarding yield of grain and straw, hectolitre weight, husk percentage, composition of the grain and reaction to crown rust. The best and most regular straw and grain yields were given by the variety Saia of *A. strigosa*; this oat also had the highest hectolitre weight but the smallest grains and highest husk percentage and was also somewhat weak in the straw; further breeding operations are being undertaken to produce a variety really suitable for the Paraná state of Brazil. In the north of the state the best results were given by Florida 167, which is distinguished by extreme earliness and good quality.

2609 ROSENSTIEL, K. VON.

Zur Beurteilung von "Fatuiden" in der Samenkontrolle des Hafers. (**On the evaluation of fatuoids in the seed certification of oats**).

Saatgutwirtschaft, Stuttgart 1953 : 5 : 155-58.

The dangers in the spread of *Avena fatua* in Germany are emphasized. Seed grain should not be condemned by the authorities because it contains a percentage of fatuoids, which are harmless. Fatuoids, although they have the structure, hairy callus and twisted awn of *A. fatua* or of hybrids between *A. fatua* and *A. sativa*, are identical in all other respects with the parent variety and lack the darker hairy glume and underdeveloped endosperm of wild oats and their hybrids.

2610 HUTCHINSON, J. B., KENT, N. L. & MARTIN, H. F.

The kernel content of oats variation in percentage kernel content and 1,000 kernel weight within the variety J. Nat. Inst. Agric. Bot. 1952 : 6 : 149-60.

Variability between individual grains of Victory oats is considered to be dependent on seasonal and other environmental differences and position of the grain on the spikelet. Only minor genetic

variations are possible within this variety, which originated as a single-plant selection.

2611 STANTON, T. R.

Production, harvesting, processing, utilization and economic importance of oats.

Econ. Bot. 1953 : 7 : 43-64.

A section on the evolution of improved breeding techniques in the USA is included in this general review, which also traces the development of varieties with winter hardiness and resistance to Victoria blight and physiological races of stem and crown rusts.

2612 FINKNER, R. E., MURPHY, H. C. & ATKINS, R. E.

Reaction of oat varieties to powdery mildew.

Agron. J. 1953 : 45 : 92-95.

None of the 4289 seedlings representing the world oat collection of the US Department of Agriculture showed immunity from *Erysiphe graminis* var. *Avenae* in greenhouse tests at Ames, Ia., but Missouri 04015 (*Avena sativa*) and Sandhafer (*A. strigosa*) were very resistant. The latter ($n = 7$) and other moderately resistant forms of *A. strigosa* may be of limited value in breeding for resistance; Missouri 04015 ($n = 21$) and moderately resistant lines of *A. sativa* and *A. byzantina* should, however, be more valuable. As some degree of mildew resistance was shown by selections from crosses between susceptible parents, breeding for resistance need not be confined entirely to resistant lines.

2613 FISCHBECK, G.

Über die Grundlagen der Resistenzzüchtung gegen *Puccinia graminis avenae* Erikss. u. Henn. und ihre Berücksichtigung im Haferzüchtungsprogramm der University of Minnesota. (**On the principles of breeding varieties resistant to *P. graminis avenae* Erikss. and Henn. and the consideration given to them in the oat breeding programme of the University of Minnesota**).

Z. Pflanzenz. 1953 : 32 : 143-52.

The writer gives an account of the extent of black rust (*P. graminis* var. *Avenae*) in oats in the USA, of the types and origins of varieties resistant to it and of investigations into the inheritance of resistance to the disease. Present research is directed to incorporating the resistant qualities of Canadian oats into present commercial varieties in the USA.

A rapid change in the strain spectrum of black rust in oats in the USA is reported. Strains 2

and 5, predominant before 1939, are being progressively supplanted by strains 7, 8 and 10.

2614 SIMONS, M. D.

Physiologic specialization and inheritance of resistance to specific races of *Puccinia coronata* Corda var. *avenae* F. & L.

Iowa St. Coll. J. Sci. 1953 : 27 : 253-54.

The following set of ten differential oat varieties was found to be the most efficient for identifying races of crown rust: Anthony, Victoria, Appler, Bond, Landhafer, Santa Fe, Ukraine, Trispermia, Bondvic and Sáia. With this set, 27 races were differentiated. Inheritance of the Landhafer type of resistance to races 101 and 1 was apparently controlled by a single gene, whose degree of dominance varied in different crosses. The data suggested that the resistance of Trispermia to these two races was also determined by a single gene, whose level of dominance differed according to the cross. The Santa Fe type of resistance to races 45 and 101 depended upon two linked genes with a recombination value of approximately 23%.

2615 **Seed supply of LaSalle oat to be increased for farm planting in 1954.**

What's New Crops Soils 1953 : 5 : No. 7 : p. 28.

La Salle was bred from Marion x Clinton at the Illinois College of Agriculture. It is moderately resistant to crown rust race 45 and resistant to smut and all races of stem rust except race 7. In central and southern Illinois, La Salle outyielded Clinton and matures about three days sooner.

2616 BOWMAN, D. H.

Delair—early oat for the Delta accepted for certification.

Sth. Seedsman 1953 : 16 : No. 5 : p. 72.

Delair, a tall, vigorous, stiff-strawed oat, developed at the Delta Branch Agricultural Experiment Station from Fulghum x Bond, has been certified for release in Mississippi. It is particularly recommended for the Delta region, where it matures early, leaving the land free for soya beans. Delair possesses resistance to Victoria blight and is as winter hardy as Nortex 107, Delta Red 88 and Fulgrain.

2617 **Oat variety trials.**

Mon. Rep. Minist. Agric. N. Ire. 1953 : 27 : 336-38.

Grain and straw yields of varieties grown on soils of high fertility and poorer hill districts in Armagh, N. Ire., during 1952 are reported. No variety yielded significantly better than the

average for all varieties tested on either type of soil.

2618 KELLY, A. F.

Variety trials of winter oats 1944-50.

J. Nat. Inst. Agric. Bot. 1952 : 6 : 133-39.

In all trials at several centres in England, the grain yields of 10/3, S 147 and S 172 were significantly higher than those of the control Grey Winter. Picton also outyielded the latter and proved very resistant to eelworm. S 172 showed the best resistance to lodging.

2619 KELLY, A. F.

Variety trials of oats for upland areas 1949-51.

J. Nat. Inst. Agric. Bot. 1952 : 6 : 140-48.

On the basis of grain and straw yields reported from two series of trials on uplands in England and Wales, Primus and Orion III are recommended for early maturing fodder, and, from the later maturing series, Victory and Maldwyn prove capable of replacing Radnor Sprig and Black Tartar, at present recommended for these conditions.

2620 PENDLETON, J. W., BEVER, W. M., BONNETT, O. T. & McKIBBEN, G. E.

Spring oat varieties for Illinois.

Circ. Ill. Agric. Exp. Sta. 1953 : No. 704 : Pp. 8.

Yields of oats at three test centres are given for 1952, with brief descriptions of varietal characteristics. The release of three crown-rust resistant varieties, Mo. 0-205, Clintafe and La Salle, is reported (cf. *PBA*, Vol. XXII, Abst. 314, Vol. XXIII, Absts. 1111 and 2615).

2621 FREY, K. J.

Oat varieties for southern Michigan.

Quart. Bull. Mich. Agric. Exp. Sta. 1953 : 35 : 294-98.

The results of recent varietal trials of oats are surveyed. Brief descriptions are given of the four varieties recommended for Michigan, viz. Clinton, Craig, Eaton and Kent.

RYE

2622 NAKAJIMA, G.

(Cytogenetical studies of an F_1 plant of *Haynaldia* x rye).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : p. 26. (Abst.). [Japanese].

A description is given of the morphology and cytology of a single F_1 plant obtained by pollinating *H. villosa* with rye. At meiotic metaphase, 10-14 univalents and 0-2 bivalents

were observed; these segregated in all ratios from 7:7 to 14:0, the most frequent value being 10:4.

- 2623 Forsøg med tetraploid rug 1950-1952. Foreløbig meddelelse. (**Trials with tetraploid rye, 1950-52. Preliminary communication**).

Tidsskr. Planteavl 1953 : 56 : 537-39.

At four research stations in Denmark, Tetraploid Stålrug [Tetraploid Steel rye] and Tetraploid Petkusrug [Tetraploid Petkus rye] gave lower yields than diploid Petkus rye; the stiffer straw of the Petkus tetraploid cannot outweigh its inferior yield. Also, the danger of pollination by diploid rye with a consequent reduction in yield would have to be considered in cultivating tetraploid rye.

- 2624 HAGBERG, A.

Kärnansatsen hos Dubbelstålråg vid odling i grannskap av diploid råg. (**Seed setting in Dubbelstålråg [Double Steel rye] grown in the vicinity of diploid rye**).

Sverig. Utsädesfören. Tidskr. 1953 : 63 : 63-69.

In a preliminary experiment bearing on the problem of the minimum distance required to prevent cross pollination between $4n$ and $2n$ rye, observations were collected on the set of seed in: (a) a 0.5 ha. oblong plot of the tetraploid variety Dubbelstålråg in the middle of a large field of diploid Petkus II; (b) a large field of $4n$ rye only; and (c) a field of $2n$ rye only, at a suitable distance from (b) to prevent cross pollination. The yield of grain from (a) was 22 dt. per ha., while (b) gave 42 dt. per ha., (c) 40 dt. per ha. and the diploid rye round (a) 30 dt. per ha.

In (a) the set of seed was only 10% in the southwest corner and 17% in the southeast corner, but the northeast corner showed no such diminution, though the lowest set on the $2n$ side of the boundary occurred adjacent to the northeast corner, probably owing to predominantly southwest winds during flowering. At 2-3 metres from the boundary, the set in the plot was higher than at the boundary, and at 6-7 metres the set in the plot was 42.3%, approximately the mean for the whole plot. The set in plot (b) was 60.1%.

2625. PASTUŠENKO-STRELEC, N. A.

(**Overcoming self sterility in rye by intraclonal hybridization**).

Agrobiologija (Agrobiology) 1952 : No. 6 : 111-15. [Russian].

At the Institute of Genetics of the USSR

Academy of Sciences, the rye Vjatka, divided into clones and trained under varied external conditions, produced more fertile seed per plant when intercrossed than material selfed in the normal way.

- 2626 LARIČEVA, M. D.

(**A study of the fertility of rye grains borne on wheat plants**).

Agrobiologija (Agrobiology) 1952 : No. 6 : 110-11. [Russian].

A rye grain, found in the ear of the Armenian hard wheat Zarda, was sown at the Timirjazev Agricultural Academy. It produced a rye plant bearing 75 large rough vitreous grains, although the ears had been isolated. Plants derived from this seed were again capable of producing normal seed, despite the emasculation and isolation of some ears or isolation of others.

- 2627 KRASNJUK, A.

(**Volžanka, a highly productive variety of winter rye**).

Kolhoznoe Proizvodstvo (Collective Farming) 1952 : No. 5 : p. 58. [Russian].

Volžanka [Volga] was obtained by intervartietal hybridization, involving the local Eliseevskaja rye, at Saratov. It is hardier and more productive than Saratov I and shows a higher degree of resistance to drought and lodging. Its grain is large and has good baking and milling properties.

- 2628 ANDERSEN, T.

Forsøg med rugsorter, 1946-1951. (**Trials with rye varieties, 1946-51**).

Tidsskr. Planteavl 1953 : 56 : 317-33.

This report deals more comprehensively with the experiments already reviewed in Abst. 1120.

MAIZE

- 2629 KOPF, K.

(**Inheritance and interrelationships of some maize ear characters**).

Iowa St. Coll. J. Sci. 1953 : 27 : 203-04.

The inheritance and interrelationships of several characters were analysed in inbreds and their combinations in single and back crosses. The pH of the water extract of the cob meal was inversely related to resistance to *Nigrospora Oryzae*, intensity of midcob colour and breaking strength of cob. The predictive value of the weight, length and diameter of the cob when combined for estimating the yield of single crosses was high; 50-65% of the variation in single-cross yields could be explained by the concomitant variation in these three characters.

In single crosses of inbreds highly selected for uniformity of maturity and yield potential, only 25% of the variance for these characters was attributable to the genotype; the chief source of variation was sampling variation. Intense red pigmentation of the midcob was associated with higher yield, higher breaking strength and weight of cob, and later date of silking. It is suggested that use of the characters of breaking strength, midcob colour, cob weight and silking date should prove valuable in selection during both the early and advanced stages of breeding.

- 2630 GARDNER, C. O., HARVEY, P. H., COMSTOCK, R. E. & ROBINSON, H. F.

Dominance of genes controlling quantitative characters in maize.

Agron. J. 1953 : 45 : 186-91.

Estimates of average dominance, dominance variance and additive genetic variance for genes controlling yield, number of ears per plant, ear length, ear diameter, number of kernel rows, plant height, ear height and time of flowering are given for the F_2 of NC 7 x CI 21 and NC 33 x K 64 grown at Rocky Mount and Raleigh, N.C. Data compare favourably with results previously reported for six of the same characters (cf. *PBA*, Vol. XX, Abst. 265), with the exception of genes for ear length in the F_2 of NC 33 x K 64. The possibility that estimates of the average degree of dominance for the latter genes may be biased by linkage, epistasis and interaction between genotype and environment is discussed (cf. p. 668). Since no type of epistasis likely to be the source of much bias has yet been found, it is assumed that estimates should be interpreted in terms of overdominance or linkage among partially and completely dominant genes. The fact that there is no indication of overdominance of other quantitative characters contributing to yield suggests that linkage is responsible for the bias. Whatever the cause, however, the magnitude of the estimates obtained should be considered in planning a maize breeding programme.

Average degrees of dominance were of the same magnitude for plant and ear height in both populations; this correlation suggests that certain genes affect both characters.

- 2631 STADLER, L. J. & NUFFER, M. G.
Problems of gene structure. II. Separation of R^r elements (S) and (P) by unequal crossing over.

Science 1953 : 117 : 471-72. (Abst.).

Crossing-over data have indicated that the components (S) and (P) of the gene complex R^r

in maize are separable genic elements, which are probably synaptically homologous (cf. *PBA*, Vol. XXII, Abst. 1873).

- 2632 JUGENHEIMER, R. W., SILOW, R. A. & MAO, Y. T.

Results of co-operative hybrid maize tests in European and Mediterranean countries 1950. A progress report.

Develop. Pap. FAO, UN, Rome 1952 : No. 31 : Pp. 43.

A full report is given of the results of trials of standard American hybrids, other hybrids and local open-pollinated varieties in 21 countries of Europe and the Mediterranean region.

- 2633 GRAEBER, W.

Was leisten die deutschen Sorten im Grün- und Gärfuttermaisanbau? (What results do the German varieties give in growing forage and silage maize?)

Mitt. dtsh. LandwGes. 1953 : 68 : 503-05.

Figures are given showing that American hybrids such as US 13 are too late in maturity for German conditions and owing to their much lower sugar content produce less palatable fodder and silage than the best German varieties, which they have not surpassed in yield of green matter.

- 2634 REITERER, M.

Welche Maissorte soll ich anbauen? (What maize variety shall I plant?).
Kärntner Bauer 1953 : 103 : 130-31.

None of the American hybrids equalled local varieties in the Carinthia province of Austria in 1952 but late hybrids from the USA proved markedly superior for silage in the more favourable districts for maize growing.

- 2635 Rapporto sulla sperimentazione maidicola 1951. (**Report on maize experiments in 1951**).

Pubbl. Staz. Sper. Maiscolt., Bergamo 1952 : No. 71 : Pp. 49.

An average yield of 21.7 q. per ha. in 1951 compared favourably with that of 15.5 c. per ha. in 1950. The results of the trials in different parts of peninsular Italy and the islands are presented, together with those of a series of experiments on the effect of different sowing dates on the development of a number of hybrids of varying maturity ratings.

- 2636 ANGULO BUSQUETS, M.
Los híbridos de variedad por línea en el maíz. (**Variety x line hybrids in maize**).
Agricultura, Madr. 1953 : 22 : No. 249 : 8-14.

Various disadvantages of hybrids from inbred lines, of the American type, for cultivation in Spain are mentioned and figures are given showing that the yields obtained from crosses between suitable inbreds and a local variety Hembrilla de Aragón are not significantly inferior to those from double crosses, exceeding those from the variety itself by 23-69%. In poorer soils crosses between the variety and the double cross hybrids exceeded the double crosses in yield, but these differences tended to be reversed under favourable conditions.

- 2637 FREITAS, A. P. DO C. E.
Acerca do melhoramento do milho. (**On breeding maize**).
Rev. Agron., Lisboa 1947 : 35 : No. 4 : 18-74.

A general account is given of the botanical characteristics of the species and its main varieties, the problem of its origin, and the various methods of improvement that have been used, indicating the most important characters for which selection has been practised, the various methods that have been used for producing hybrid corn and some special problems facing maize breeders in Portugal. The desirability of carrying out breeding operations in the area and under the farming conditions for which the improved forms are designed and of basing the selection on a large quantity of initial material is emphasized.

- 2638 Milhos híbridos. (**Hybrid maize**).
Inform. Téc. Direcç. Ger. Serv. Agríc., Lisboa 1953 : Estudos Inf. Téc. No. 39 : Pp. 40.

The further data presented confirm those previously published (cf. *PBA*, Vol XXII, Abst. 2656), the excess of yield from the hybrids over those of the local varieties varying from 7 to 224.4%, the latter figure being obtained with the hybrid Kansas 1859.

- 2639 LAUBSCHER, F. X., JOSEPHSON, L. M. & GROBBELAAR, W. P.
Performance of maize varieties in the highveld region.
Fmg. in S. Afr. 1953 : 28 : 47-51, 64.

Yield data are presented for some 50 varieties, top crosses and double-cross hybrids in co-operative trials, organized by the Potchefstroom

College of Agriculture, in maize-growing areas of the Transvaal and Orange Free State.

- 2640 FINDLEY, W. R. (JUN.).
Report of the tenth Southern Corn Improvement Conference held at College Station, Texas June 25-27, 1952.
Div. Cereal Crops Dis. Bur. Pl. Indust., Soils Agric. Engin., Beltsville, Md. 1952 : Pp. 43. (Mimeographed).

Information is presented on the organization of state variety testing programmes and on the present status of breeding schemes to incorporate male sterility in inbreds. Breeding and other aspects of insect control were discussed. W. A. Douglas contributed a paper on the earworm resistance of inbreds and their single crosses. Resistance could be studied more effectively in the vigorous hybrids than in inbreds. Inbreds contributing resistance to single crosses are listed. A discussion on diseases included an account by A. L. Robert of breeding for resistance to *Helminthosporium turcicum* at the Plant Industry Station, Beltsville, Md. (cf. Abst. 319). Good sources of resistance have been secured among yellow and white inbreds, using artificially produced epidemics. A. Grobman reported initial progress in the cooperative project for the collection and preservation of the germ plasm of South American varieties. Collection centres have already been established in Mexico, Colombia and Brazil. Reports, summarized below, are given for the state stations and also for Israel.

Alabama

Production of new inbreds from open-pollinated varieties and crosses between Corn Belt inbreds and inbreds developed in the southeastern United States continued. Recurrent selection is in progress.

Arkansas

The best yellow inbred lines extracted from local varieties are being tested in top and single crosses. Over-all improvement of some of the older inbreds is being effected by back-crossing.

Florida

Recurrent selection for specific combining ability continued. Cytoplasmic male sterility and factors for restoring pollen fertility are being incorporated in some widely used inbreds.

Georgia

At the Coastal Plains Agricultural Experiment Station, Tifton, inbreds are being developed from open-pollinated maize and crosses between

various types. Several types of synthetics have been produced. Lines now in use, viz. GT 112, F 6, F 44 and L 578, are being improved by back-crossing. A male-sterile form of a Paraguayan introduction is easily converted to fertility by crossing with most lines. Inheritance of resistance to rice weevil is being investigated. Selection for resistance to a kind of seedling blight occurring in some inbreds is being attempted; no causal pathogens have so far been discovered. At the College Experiment Station emphasis is being given to testing inbreds for resistance to *Helminthosporium* spp. and other diseases. In addition, studies are being carried out on the following: the cytoplasmic influence of inbreds upon combining ability in double crosses; competitive effect of entries with different maturity dates in yield trials; comparison of testers for determining combining ability; and the relationship of double cross hybrids with different designations.

Louisiana

In addition to the regular programme of hybrid breeding, investigations on the use of male sterility and on the inheritance of earworm susceptibility are in progress.

Mississippi

At the Mississippi Agricultural Experiment Station, use of the cross between closely related inbreds in single crosses, instead of an inbred, shows promise as a means of improving seed production. Three-way crosses are being tested at several centres, comparing closely related lines. The new double cross Miss.1123 (T 101 x Mp 305) (Mp 307 x Mp 311) should be relatively easy to produce without detasseling as soon as male sterility is incorporated in T 101 from the Texas line, since Mp 307 restores fertility to this source of male sterility.

At the Delta Station, work is continuing on the transference of male sterility of the Texas line to Mississippi inbreds. A yellow inbred from Tx. 61M x Tx. 127C is suitable for restoring pollen fertility.

Missouri

The chief aim in improving hybrids is resistance to lodging. New inbreds have been selected from open-pollinated varieties and single crosses. Selection of the latter two types of material is recommended before relying on the gamete selection method. Particularly promising selfs have been obtained from single crosses involving one line from the southern United States and another from Minnesota or Wisconsin. An attempt is being made to extract disease and

insect resistant lines from synthetics. Breeding for a higher content of amylose starch is under way; a search is being made among strains from various countries for modifiers of amylose content.

North Carolina

Five new hybrids have been released: Dixie 82, the white hybrids NC 29 and NC 31, with medium late maturity, and the early maturing yellow hybrids NC 24 and NC 36, recommended for the upper mountainous region (cf. *PBA*, Vol. XXII, Abst. 2658). Progress has been made in recurrent selection and reciprocal recurrent selection. In tests of breeding stocks for their reaction to *Physoderma Zeae* var. *Maydis*, GT 154, F 44 and NC 42 showed resistance. Forty-three inbreds were tested for their ability to restore pollen fertility, when crossed with the Texas male-sterile line; NC 77 completely restored fertility in the F_1 .

Oklahoma

A programme of mass selection is being carried out (1) to establish desirable gene frequencies and combinations of characters prior to inbreeding; (2) to determine the advance possible by this method; and (3) to obtain information on the variation and heritability of different characters.

Male sterility is being incorporated in the best seed parents. The character of short internode is being introduced into several inbreds, to explore the value of "dwarf" maize.

Resistance to stalk rots and corn borer is receiving attention.

South Carolina

Crosses of Corn Belt and Semi-Corn Belt lines with late, tight-husked material have provided better inbreds than local varieties.

Tennessee

Seed stocks of nine new hybrids are being increased. Crosses of inbreds with the Texas male-sterile line were studied for their degree of fertility.

Texas

The white hybrid Texas 15W was released (cf. Abst. 1918). Native open-pollinated varieties have been subjected to a considerable amount of inbreeding. Male-sterile seed stocks of both inbreds and single crosses are being increased for commercial production.

Division of Cereal Crops and Diseases

Lines resistant to leaf blight (*Helminthosporium turcicum*), developed by back crossing at Belts-

ville, Md., are under trial in test crosses in the Corn Belt. Other work being carried out on this disease includes a linkage test of genes for resistance, using a multiple-recessive stock.

Israel

A programme of hybrid production was initiated at the Government Agricultural Experiment Station, Neveh Ya'ar, in 1948. Introduced hybrids have been tested; US 13 has given good results. Inbred R 39 has been substituted in hybrids for L 317, which does not yield well under local conditions. Inbreds have been developed from local maize, general combining ability in the S_1 and S_3 having been tested in top crosses with the local varieties. Cold tolerance is being given special attention, so that earlier plantings, taking advantage of the early rains, may be made.

- 2641 FINDLEY, W. R. (JUN.)
Report of the Thirteenth Corn Improvement Conference of the North Central Region, Chicago, Illinois, February 5 & 6, 1953.
 Div. Cereal Crops Dis., Bur. Pl. Indust. Sta. Beltsville, Md 1953 : Pp. 32. (Mimeographed).

The report begins with a brief account of the Illinois Maize Research Centre, Illinois University. Its objectives consist of (1) the maintenance and preservation of adapted genetic stocks, (2) development of new combinations of testers, (3) linkage determinations and (4) the search for new genes. The work of the centre is to begin in July, 1953.

Policy concerning breeding programmes with male-sterile lines was laid down. Tables showing the present status of work on incorporating male sterility in inbreds at the different stations are included.

In the report of the Committee on the Preservation of Germ Plasm, additions to the following lists are given: (1) inbred lines of field maize with special breeding value, (2) released inbreds of field maize, sweet corn and popcorn, (3) inbreds of field maize used in recommended hybrids, and (4) recommended hybrids and their pedigrees (cf. Abst. 1135 and 1136). Up-to-date information on the preservation of open-pollinated material in the different states is also provided.

Breeding with monpoids was discussed. Other reports given are those of the committees concerned with grouping inbred lines for breeding purposes and with uniform tests of hybrids possessing different maturities.

- 2642 HALTIWANGER, W. L., NEAL, C. W. & FRIANT, R. J.
Results of hybrid corn yield trials in West Virginia for 1952.
 Curr. Rep. W. Va Agric. Exp. Sta. 1953 : No. 4 : Pp. 10.

On the basis of yields obtained in 19 cooperative county trials, maize hybrids are recommended for each part of the state. The pedigrees of experimental hybrids are included.

- 2643 CRANE, P. L., NEWMAN, J. E. & MILES, S. R.
Performance of corn hybrids in Indiana through 1952.
 Sta. Circ. Purdue Agric. Exp. Sta. 1952 : No. 389 : Pp. 32. (Mimeographed).

A summary is given of the results of recent trials of dent maize hybrids with privately controlled or open pedigrees in Indiana.

- 2644 PENDLETON, J. W., *ET AL.*
1952 Illinois corn tests.
 Bull. Ill. Agric. Exp. Sta. 1953 : No. 564 : Pp. 32.

Data are given on the performance of 242 maize hybrids grown at five centres. Current results are compared with those for the two previous years. An analysis of yields of nine single crosses, widely used as parents for commercial hybrids, shows variability in response to planting rate; yields may perhaps be increased by developing hybrids adapted to higher planting rates.

- 2645 ROSSMAN, E. C.
Michigan 480—a new corn hybrid.
 Quart. Bull. Mich. Agric. Exp. Sta. 1953 : 35 : 288–93.

The hybrid Michigan 480 [(W23 x Oh. 51A) x (W 10 x Oh. 40B)] is well adapted as a medium early maize for grain and silage in southern and south-central Michigan; in the north-central region it is suitable as a full-season hybrid. It has outyielded several other hybrids, and has a high shelling percentage (82–83%). It is more resistant to stalk and root lodging than Ohio M15 and Michigan 350, and is suitable for mechanical harvesting.

- 2646 GUTIERREZ, M. G.
Factors affecting randomness of mating in isolated polycross plantings of maize.
 Iowa St. Coll. J. Sci. 1953 : 27 : 183–84.

In one experiment, the yields of polycrosses produced between inbreds in different replicates of the same polycrossing block were compared. In another test, a determination was made of the pollination frequencies of nine stocks, marked by recessive genes, under conditions of

open pollination in a replicated polycrossing block. In the second experiment, individual plant data were obtained on number of plants shedding pollen, length of pollen-shedding period, plant height, and dates of tasseling and silking. The effects of each of these factors and of position in the polycrossing block upon the frequency with which a stock acted as a pollinator were examined by means of regression and correlation analyses. Total weight of pollen shed, and the amount of differential fertilization in paired pollinations with pollen mixtures were also estimated, using seven of the marked stocks. The range in yield among the polycrosses of the same inbred in both experiments was significant. The pollination frequencies in five stocks with similar characteristics of flowering deviated significantly from those expected with random mating, the number of gametes produced by the lines being assumed to be the same. Regression of percentage of pollinations on number of plants shedding pollen and length of pollen-shedding period was positive and significant; regression of percentage of pollinations on plant height was negative and highly significant. The correlation between length of pollen-shedding period and percentage of pollinations was independent of the number of plants shedding pollen and plant height. Although the regression of percentage of pollinations on date of tasseling and silking was essentially zero for the experiment as a whole, intrastock correlations of these characters indicated a marked tendency towards sibbing and more frequent pollinations among stocks of the same maturity group. The association between weight of pollen shed and percentage of pollinations was not significant; weight was therefore a poor measure of number of pollen grains produced. No evidence was obtained of more frequent crossing among stocks occurring in adjacent plots of the polycrossing block. The data from the paired pollinations by pollen mixtures were conflicting.

It is suggested that the results obtained are applicable to forage grasses, and that general combining ability should be tested in these crops by artificial intercrosses, in order to avoid the effect of factors causing departures from random mating.

- 2647 ZUBER, M. S. & GROGAN, C. O.
Corn hybrids adapted for Missouri.
Bull. Mo. Agric. Exp. Sta. 1951 : No. 546 : Pp. 12.

Descriptions are given of ten maize hybrids recommended for different regions in Missouri.

- 2648 GIRAL, J. & LAGUNA, J.
Triptofano y niacina en maíces híbridos Mexicanos. (**Tryptophane and niacin in Mexican hybrid maizes**).
Ciencia, Méx, 1952 : 12 : 177-79.

Determinations carried out on 10 Mexican maize varieties, 8 of them hybrids, showed that both tryptophane and niacin are localized mainly in the germ; the tryptophane content of the hybrids was lower than that of the local varieties, very little difference being detectable in the niacin contents.

- 2649 BAUMAN, L. F., ALEXANDER, D. E., JUGENHEIMER, R. W. & WOODWORTH, C. M.
Experimental corn hybrids tested in 1952.
Bull. Ill. Agric. Exp. Sta. 1953 : No. 563 : Pp. 19.

Over 200 experimental double crosses and a few male-sterile single crosses and their hermaphrodite counterparts were compared in maize trials at four centres. Data on yield, time of maturity, plant height, ear length, resistance to lodging and other agronomic characters are presented. Yield differences between male-sterile single crosses and their fertile counterparts and between double crosses derived from male-sterile seed parents and those from normal pollen-shedding forms were not significant. Male-sterile single crosses were consistently shorter than their normal counterparts.

- 2650 PACI, C.
Valore alimentare e biologico dei mais ibridi rispetto alle varietà locali a fecondazione libera. (**Nutritive and biological value of hybrid maize in comparison with the local open-pollinated varieties**).
Ital. Agric. 1953 : 90 : 355-65.

Investigations at the University of Turin are referred to in which it was shown that the open pollinated varieties grown in the north of Italy are richer in proteins and vitamin A than the hybrids introduced up to now, though the deficiency seems to be made good by the increased yields of the hybrids. Results from the Bergamo maize research station are cited to show that the hybrids are 6-7% less in content of digestible protein and somewhat less in arginine but higher in methionine content, white maize being higher than yellow and flint higher than dent; dent hybrids are somewhat higher in content of nicotinic acid.

2651 ŽUKOVSKIĬ, P. M., *ET AL.*

(Ivan Vasiljevič Kožuhov).

Selekcija i Semenovodstvo (Breeding & Seed Growing) 1952 : No. 12 : 72-73. [Russian].

This obituary of I. V. Kožuhov, a maize breeder and taxonomist, contains references to new hybrid maizes developed by him in recent years. The new maizes include double crosses which outyield other varieties by 5-15 c. per ha.

2652 MAZOTI, L. B.

Plántula reducida: nueva variación citoplasmática heredable en *Zea*. (**Reduced seedling, a new heritable cytoplasmic variation in *Zea***).

Rev. Argent. Agron. 1953 : 20 : 7-10.

The cytoplasmic entity in question was introduced into maize by crossing with teosinte and besides causing a reduction in width of the third leaf of the seedlings it inhibits the gene *ij* and prolongs the vegetative period.

2653 TULPULÉ, S. H.

A study of pleiotropic genes in *Zea Mays* L.

Diss. Abstr. 1953 : 13 : Publ. No. 4482 : 10-11.

The kernels of four spontaneous mutants have a lemon-coloured endosperm and give rise to pure white seedlings lacking both chlorophyll and carotenoids. The single genes determining these four lemon-white mutants have been designated *lw*₁, *lw*₂, *lw*₃ and *lw*₄, respectively, and are regarded as possible cases of pleiotropism. The factors *lw*₃ and *lw*₄ are duplicate; *lw*₁ and *lw*₂ give monofactorial ratios. Close linkage has been detected between *lw*₂ and *lw*₃. The four genes have been located on the following chromosomes: *lw*₁ in the distal region of chromosome 1; *lw*₂ and *lw*₃ on the long arm of 5; and *lw*₄ on chromosome 4, between *su*₁ and *gl*₃.

2654 DZJUBENKO, L. K.

(**Experiments on grafting maize embryos on endosperms**).

Bot. Ž. (Bot. J.), Kiiv 1950 : 7 : No. 3 : 12-23. [Ukrainian].

At the Botanical Institute of the Ukrainian Academy of Sciences, embryos of the maize Vengerskaja Černaja [Black Hungarian] were grafted on endosperms of two other varieties, Harjkovskaja Belaja Zubovidnaja [Harjkov White Dent] and Hybrid 1. The grafted plants produced ears with dark, white and yellow kernels and white or yellow kernels with mauve spots or patches. Some dark kernels had dark or pale yellow endosperms. The changes in colour of the grafted material resembled those

observed in the F₁ of Vengerskaja Černaja x Harjkovskaja Belaja Zubovidnaja + Hybrid 1.

2655 PLANT, W. S.

The effect of B chromosomes on the variegated pericarp phenotype in maize.

Amer. J. Bot. 1953 : 40 : 344-48.

The suggestion that heterochromatic elements are responsible for the origin and expression of variegation in maize, as in *Drosophila* (cf. *PBA*, Vol. XX, Abst. 2294), has been examined at Madison, Wis. Four different open-pollinated lines of maize heterozygous for *P^{vv}*, an unstable allele controlling variegation of the pericarp, were fertilized with pollen from stocks carrying heterochromatic B chromosomes. An analysis of the association between degree of pericarp variegation and the number of B chromosomes in resulting progenies indicated that variegation intensity was not completely independent of the presence of 0-12 B chromosomes, but only a small positive enhancing effect could be detected.

2656 SCHWARTZ, D.

The behaviour of an X-ray-induced ring chromosome in maize.

Amer. Nat. 1952 : 87 : 19-28.

The behaviour of an X-ray-induced ring involving almost the whole of chromosome 6, the nucleolar-organizer chromosome, is described. Crossing over between the ring and its rod homologue, followed by breakage of the resultant anaphase bridges, frequently converted the ring into a rod chromosome. Some of the rods carried a duplication and were transformed into rings in subsequent meiotic divisions. The inclusion of the nucleolar-organizer region in the anaphase bridge resulted in a high frequency of aberrant spore quartets.

2657 BALDONI, R.

Ricerca di individui monoploidi per la costituzione rapida di linee omozigote di mais. (**Search for monoploid individuals for the rapid constitution of homozygous lines of maize**).

Ital. Agric. 1953 : 90 : 397-405.

In an attempt to apply the method of Chase (cf. *PBA*, Vol. XX, Abst. 1614) to maize breeding in Italy, a number of varieties and hybrids were pollinated with each of 5 pollen parents bearing marker genes for root colour. All seedlings with coloured roots were discarded and the rest examined cytologically. The progeny of Sokata 224 contained no haploids. The other American hybrids contained haploids varying in proportion from 1 to 2.5 per thousand;

the proportion in the progenies from Italian varieties also varied from 0 to 1.6 per 1000. The 38 haploids obtained are being subjected to colchicine treatment in the attempt to produce pure-breeding diploids.

2658 CARLES, J., SOUBIÈS, L., GADET, R. & MAURY, P.

Le saccharose et le maïs hybride. (Sucrose and hybrid maize).

CR Acad. Sci. Paris 1952 : 234 : 1899-901.

The total quantity of soluble sugars is considerably greater in the maize hybrids studied in France than in varieties. The most conspicuous component of the increment is sucrose.

2659 DUNN, G. M., KRAMER, H. H. & WHISTLER, R. L.

Gene dosage effects on corn endosperm carbohydrates.

Agron. J. 1953 : 45 : 101-04.

Whole grains with all possible endosperm genotypes resulting from a cross between two lines of maize homozygous for *su du* and *su₂* respectively, were analysed for total starch content, amylose percentage and water soluble polysaccharides. All three genes exhibited a high degree of dominance, both for amylose and total starch content. Interaction between *su* and *du* increased the amylose percentage, but *su₂* proved the most efficient individual gene in this respect. For all genotypes, however, a highly significant negative correlation ($r = -0.80$) was found between total starch and percentage of amylose in the starch. The triple recessive *su su₂ du* had starch containing 77% amylose, but the total starch content was only 9%. Thus no substantial increase in yield of amylose is possible.

2660 GALINAT, W. C. & ANDREW, R. H.

Stolon-producing corn.

Agron. J. 1953 : 45 : 122-23.

Decumbent stoloniferous tillers produced by corn grass, a mutant of maize (cf. *PBA*, Vol. XXI, Abst. 1829 and Vol. XXII, Abst. 359), bear axillary shoots with adventitious roots; these remain vegetative long after the main stem has flowered and died, but are eventually killed by frosts. If winter hardiness could be incorporated, it is considered that a perennial habit would be achieved.

2661 NEPTUNE, G. & ROSSMAN, E. C.

Cold test germination of hybrid seed corn.

Quart. Bull. Mich. Agric. Exp. Sta. 1953 : 35 : 343-50.

Maize hybrids showed marked differences in germination percentages in cold tests at 45°F

for 10-14 days; this behaviour is attributed to genetic constitution and other factors. Differences in germination were noted among samples of the same hybrid produced by separate seed growers. New seed gave higher germination percentages than seed one or two years old. Association between germination percentage in cold tests and seedling vigour was significant only in the case of new seed. Neither maturity nor grain yield showed any consistent relationships with germination percentage in cold tests and seedling vigour.

2662 Introducing "N.J.8." A new high-yielding hybrid field corn.

N. J. Agric. 1953 : 35 : No. 2 : p. 12.

The New Jersey Agricultural Experiment Station has released NJ 8, a maize hybrid developed from (WF 9 x Hy) (C 102 x C 103). It matures at the same time as US 13 and NJ 7, equals the grain and silage yields and lodging resistance of the latter, but is superior in respect of quality, number of well-filled grains per ear and adaptation to machine husking.

2663 Release new hybrid corn for farmers in Michigan.

What's New Crops Soils 1953 : 5 : No. 8 : p. 27.

Michigan 480, a maize hybrid which matures in 106 days, has been bred at the Department of Farm Crops, Michigan State College. It shows greater resistance to lodging than Ohio M 15 and Michigan 350, and yields more fodder than either variety. Grain yields of Michigan 480 average 14% more than Ohio M 15 per acre.

2664 Artificial inoculation of maize with *Puccinia polysora* (Schw.).

Agric. Abstr., Dept. Agric. Nigeria 1952 : 11 : No. 4 : p. 4.

A newly devised method for determining the rust reaction of maize some 17-20 days after germination under controlled greenhouse conditions at the Maize Rust Research Unit, Ibadan, facilitates the selection of resistant seedlings. It has also demonstrated the potential susceptibility of certain lines which have so far remained symptomless in the field.

2665 TAYLOR, G. S.

Stalk rot development in corn following the European corn borer.

Iowa St. Coll. J. Sci. 1953 : 27 : 265-66.

Resistance to *Diplodia Zeae*, as determined in inoculation tests of four inbred lines, their F_1 and F_2 hybrids and their back crosses, showed a complex inheritance. F_1 hybrids between moderately resistant and susceptible inbreds,

however, possessed a degree of resistance approaching that of the resistant parent; F_2 hybrids and back crosses exhibited a level of resistance intermediate between two such parents. The stimulative effect of aqueous extracts and expressed juices of inbreds upon growth of *D. Zeae* was inversely related to relative rot resistance of the lines; the content of total solids in the juices was directly associated with the growth-stimulating effect.

2666 Three new corn hybrids developed for Minnesota.

What's New Crops Soils 1953 : 5 : No. 7 : p. 28.

The Minnesota Agricultural Experiment Station has released the following new maize hybrids: Minhybrid 411 and Minhybrid 412, both resistant to the first brood of the corn borer, and a borer tolerant hybrid, AES 610.

BARLEY

2667 ATKINS, I. M.

Cordova barley.

Bull. Tex. Agric. Exp. Sta. 1953 : No. 760 : Pp. 10.

Further information is given on Cordova barley. (cf. Abst. 1956).

2668 Seedmen's corner.

Canad. Grain J. 1953 : 8 : No. 9 : p. 23.

Gateway barley, developed from Olli x Newal at the University of Alberta, has been licensed for release in Canada. It has smooth awns and stronger straw than Olli, which it outyields; it matures at the same time as Olli and is therefore expected to do well in north-central and northern areas where earliness is important.

2669 NÖTZEL, H.

Genetische Untersuchungen an röntgeninduzierten Gerstenmutanten. (**Genetic investigations into barley mutations induced by X rays**).

Kühn-Arch. 1952 : 66 : 72-130.

Investigations were carried out on 34 morphological and 6 physiological (early germinating) mutants of Haisa barley with the intention of isolating the various mutant types and discovering whether phenotypically similar mutants were genetically similar. The 34 morphological mutations were divided into five groups and crosses both within the groups and with naturally occurring varieties similar in appearance were made. The early mutants were found to germinate 2-13 days before Haisa, but M111, which germinated most quickly, was inferior in

height, yield and size of ear to the parent variety.

The *erectoides* mutants were characterized by a shortening of the rachis segment and were similar in appearance to D22 (Germany) and B,7 (Balkans).

The *zeocrithon* mutants possessed an even shorter rachis segment and were comparable with EP141 from Finland.

The *intermedium* mutants differed from Haisa in having fertile lateral spikelets which, however, did not produce grain. They resembled Ab19 (Abyssinia) and Lion (North America).

The *macrolepis* mutants were distinguished by having broad glumes, and resembled EP64 and EP124 from Abyssinia.

Mutants with hooded spikelets were also isolated and were crossed with a Nepal variety.

All the mutants except M111 were recessive, and in most cases the mutants differed genetically from the phenotypically identical types with which they were compared. The gene responsible for the *macrolepis* mutation was, however, identical with the corresponding gene in the Abyssinian varieties EP64 and EP124. Transgression sometimes occurred in the F_2 but in many cases one of the genes for the character in question proved epistatic to the other. Several of the mutants fell into allelomorph series, notably the six *macrolepis* types. In addition to the well known series of alleles for number of rows per ear, $V^{de}-v^{d}-v$, another *intermedium* allele, v^{M20} , recessive to v , was found in mutant M20.

2670 SHANDS, H. L. and DICKSON, A. D.

Barley—botany, production, harvesting, processing, utilization and economics.

Econ. Bot. 1953 : 7 : 3-26.

This general survey includes a short discussion on the origin of cultivated forms and briefly mentions the occurrence of specific linkage groups.

2671 NIKITENKO, G. F.

(**The problem of the evolution and taxonomy of the cultivated barleys**). Dokl. Akad. Nauk. SSSR (Rep. USSR Acad. Sci.) 1951 : 81 : 1147-49.

A scheme showing the probable evolution of the cultivated barleys is presented.

2672 OINUMA, T.

(**Meiosis in some wild barleys**).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : p. 20. (Abst.). [Japanese].

Meiosis is described in *Hordeum agriocrithon*, *H. spontaneum* and *H. pusillum* (all $2n = 14$) and *H. Gussoneanum* and *H. murinum* (both

2n = 28). In the diploid species, meiosis was regular. In *H. murinum* a stray quadrivalent was noted, while in *H. Gussoneanum*, up to 2 quadrivalents were observed.

- 2673 GELIN, O. E. V.
Mitotische Störungsfrequenzen in Röntgenbestrahlter Gerste. (**Frequencies of mitotic aberrations in X-irradiated barley**).
Agri Hort. Genet., Landskrona 1953 : 11 : 66-81.

The possible effects of variety, species and chromosome number or of temperature during germination upon the sensitivity of dormant grains of barley to increasing doses of X rays were investigated by estimating the frequency of mitotic aberrations.

Though no differences in sensitivity could be found in the varieties tested, Gold, Maja and Opal B (2n), the tetraploid wild species *Hordeum jubatum* and *H. murinum* differed markedly in their reaction: in the former the maximum frequency of aberrations was reached with 1000 r, and 5000 r proved lethal, while in *H. murinum* the increase in aberration frequency showed much the same trend as in commercial varieties of *H. sativum*.

In the tetraploid Opal B, the percentage of aberrations up to 15000 r was about twice as high as in the diploid.

Germination of X-irradiated seed at 30°C instead of 12°C reduced the number of aberrant mitoses.

- 2674 NISHIMURA, Y., NIIZEKI, H. & SAITO, T.
(**X-ray-induced mutations in barley**).
Ikushugaku Zasshi/Japan. J. Breeding 1952 : 1 : 210-14. [Japanese].

Investigations on the X₁ and X₂ generations of X-irradiated samples of the Japanese barley Kantohi 1 are reported. Segregation for partial sterility occurred in the X₂, and various types of structural heterozygotes were detected, including cases with 6-membered rings or two 4-membered rings. A triploid was also noted, together with mutants for male sterility, liguleless leaves and dwarf habit. The possibilities of building up multiple translocation types along the lines suggested by Burnham (cf. *PBA*, Vol. XVII, Abst. 191) are discussed.

- 2675 YAMAMOTO, K.
(**Investigations on "viviparous germination" in barley varieties**).
Nogaku Kenkyusho Iho/Bull. Inst. Agric. Res., Tohoku Univ. 1950 : 2 : 95-134. [Japanese].

This paper is a fuller version in Japanese of the

articles already summarized in *PBA*, Absts. 330 and 1192.

- 2676 YAMAMOTO, T.
(**Studies on sterility in barley. III. The connexion between sowing date and sterility**).
Hokkaido Nogyo Shiken Jo Iho/Res. Bull. Hokkaido Nat. Agric. Exp. Sta. 1952 : No. 63 : 6-15. [Japanese].

A study was made of the incidence of sterility of 14 spring varieties sown over a range of dates. In general, late sowing caused an increase in sterility and late varieties were accordingly more subject to sterility than early. Evidence is provided in support of the theory that late sowing causes sterility largely because of the associated higher temperature, which retards translocation of nutrients to the ear.

- 2677 DEN HARTOG, G. T. & LAMBERT, J. W.
(**The relationships between certain agronomic and malting quality characters of barley**).
Agron. J. 1953 : 45 : 208-12.

Data are presented concerning the inter-relations of three criteria of malting quality, namely, protein content, diastatic power and barley extract, and the association of malting quality with yield and other characters, such as kernel weight, fertility of florets and spike density, in five generations of ten crosses, involving Mars as a common parent, at St. Paul, Minn. Correlation between diastatic power and extract is due to the association of each with protein content, thus emphasizing the importance of protein content as a criterion of malting quality. It is possible to select lines possessing both high yielding ability and acceptable values for these three components of malting quality.

- 2678 WOODWARD, R. W. & THIERET, J. W.
(**A genetic study of complementary genes for purple lemma, palea, and pericarp in barley (*Hordeum vulgare* L.)**).

Agron. J. 1953 : 45 : 182-85.

Segregation ratios for anthocyanin pigmentation of the lemma, palea and caryopsis in progenies from crosses involving purple and nonpurple strains at Logan, Utah, have indicated that purple pigmentation is controlled by two complementary genes, rather than the simple dominant *P* (purple) and the recessive *p* (non-purple); the second gene is designated *C*. Purple plants are all dominant homozygotes (*PPCC*), whereas nonpurple phenotypes result from any of the following genotypes: *PPcc*,

ppCC, and *ppcc*. Linkage was detected between *Pp* and the factors determining the number of rows per ear, *V^t*, *V*, and *v*, which constitute linkage group I, and also between *Cc* and *Bb*, the gene pair determining black or white lemma, in linkage group II.

2679 New smooth-awned barley is under test in California.

What's New Crops Soils 1953 : 5 : No. 8 : p. 27.

An unnamed high-yielding selection from Atlas 46 x Lion is undergoing adaptability trials throughout the state prior to release by the University of California. It inherits smooth awns from Lion.

2680 KARTAMYŠEV, V. G.

Changes in the reproductive organs of barley).

Agrobiologija (Agrobiology) 1953 : No. 1 : 100-103. [Russian].

At Rostov, various degrees of conversions of stamens into pistils were observed in the barley varieties *pallidum* and *erectum*. The abnormal changes are attributed to external conditions, including the sowing of winter types in the spring.

2681 KUMP, M.

Nasljeđivanje duljine vegetacionog doba kod ozimog golog i obuvenog ječma (*Hordeum sativum* Jess). [The inheritance of growth periods in hybrids between naked and hulled winter barleys (*Hordeum sativum* Jess)].

Poljopr. Znanst. Smot. 1952 : No. 13 : 141-54.

At Zagreb, the inheritance of earliness in the hybrids between some naked and hulled genotypes was investigated. In the *F*₁ lateness was dominant over earliness. In the *F*₂ the variability in respect of the length of growth periods was wider than between the parental forms and between the *F*₁ hybrids, evidently owing to polymeric genes. Some of them are located in the III linkage group, which contains the genes for hulled or naked seed. A close correlation between the above characters was established, but recombinations occurred in the *F*₂. The following separate homozygous genotypes were obtained from the extreme variants of the *F*₂: (a) naked barley with the same length of growth period as its hulled parental form, (b) hulled barley with the same length of growth period as its naked seed parent and (c) hulled barley with a longer growth period than the hulled parental form.

2682 KUMP, M.

Nabusavanje roditelja i križanaca ozimog golog i obuvenog ječma. (The inheritance of tillering in crosses between naked winter barley and hulled winter-barley).

Poljopr. Znanst. Smot. 1952 : No. 13 : 133-39.

At Zagreb, two-rowed and six-rowed naked barleys had less extensive tillering capacity than some two-rowed and six-rowed hulled genotypes. In the *F*₁ of naked two-rowed x hulled two-rowed and of naked six-rowed x hulled six-rowed barleys good tillering was associated with hulled seed. The number of genes determining tillering could not be established, but a positive correlation was found between the characters of naked seed and low tillering capacity and hulled seed and extensive tillering, respectively. Some homozygous genotypes of two-rowed and multirowed naked barleys, which had the same tillering capacity as the hulled genotypes, were obtained in the progenies from the above crosses. It is thought that they arose as a result of recombination, following crossing over.

2683 MALCOLM, J. P.

Varieties of malting barley.

Bull. Canterbury (NZ) Malting Co. 1952 : No. 2 : Pp. 16.

An outline is given of the characteristics of Kenia, Research and Golden Archer, the principal varieties recommended for Canterbury, NZ. Such factors as resistance to lodging, neck break, diseases and pests, on which yield and malting quality depend, are discussed.

2684 ZWEIFEL, J. & KELLER, C.

L'orge de printemps Herta. (The spring barley Herta).

Rev. Rom. Agric. 1953 : 9 : 9-11.

The performance of this Swedish barley (cf. *PBA*, Vol. XIX, Abst. 1791) was tested under Swiss conditions. Its resistance to *Erysiphe graminis* was found inadequate, but its resistance to lodging was superior to that of Isaria, which it also surpassed in yield of grain under certain conditions. In malting quality Herta seemed to be inferior to Kenia.

2685 TAPKE, V. F.

Further studies on barley powdery mildew as influenced by environment.

Phytopathology 1953 : 43 : 162-66.

It is suggested that the capacity to develop

adult resistance may be effectively transferred to standard varieties, thus enhancing their power of resisting conditions of maximum mildew infection. (cf. *PBA*, Vol. XXII, Abst. 288).

- 2686 OSWALD, J. W., & HOUSTON, B. R.
The yellow-dwarf virus disease of cereal crops.
Phytopathology 1953 : 43 : 128-36.

A survey of the 1951 epidemic in California gives details of the reactions of oat and barley varieties. The oats Bond and Kanota and the barleys Rojo and Hannchen are considered tolerant. The only highly resistant barleys, CI 1227, CI 1237, CI 2376 and Abate, are of no commercial value but will prove useful for breeding. No wheat or oat varieties with a similar degree of resistance have yet been found.

- 2687 Société d'Encouragement de la Culture des Orges de Brasserie et des Houblons en France, SECOBRAH. **Rapports sur la campagne 1951. (Society for the Promotion of the Cultivation of Malting Barleys and Hops in France, SECOBRAH. Reports on the 1951 season).**
 Paris 1951 : Pp. 59.

A further report (cf. Abst. 343) is presented on the results of winter and spring barley trials conducted in many parts of France. The report, which is mainly in the form of tables and graphs, is concerned largely with experiments on manuring and vegetative growth.

- 2688 Forsøg med bygsorter 1949-1952. **(Trials with barley varieties, 1949-52).**
Tidsskr. Planteavl 1953 : 56 : 541-44.

Trials of Swedish and Danish barleys were carried out at 11 different experimental stations in Denmark. Two new varieties, Bonus (cf. *PBA*, Vol. XXI, Abst. 139) and Pajbjerg Drost, were tested in 1951-52, and one other new one, Weibull's Rika (cf. Abst. 1960) in 1952 only. Bonus, with 42.7 hkg. per ha. of grain, outyielded all the older varieties, while Drost gave 42.0 and Ymer 42.1 hkg. per ha. Herta and Rika had very stiff straw and a very high hectolitre weight. Carlsberg had the largest kernels and Bonus also had quite large grain.

- 2689 ELIASSON, S. & JACOBSON, G.
 Sortförsök med korn. Sammanställning av resultaten av de av Statens Jordbruksförsök ledda sortförsöken med korn under åren 1940 (1934)-1950. **[Variety trials with barley. A collation of the results of the barley variety trials conducted during the years 1940 (1934)-1950 by the National Agricultural Research Service].**
 Medd. Jordbruksförsök, Stockholm 1952 : No. 41 : Pp. 130.

Most of the tested barleys, whose origin and main characteristics are enumerated, were bred at the Svalöf or Weibullsholm institutes, but some Finnish and Danish varieties were included in the trials at a later stage. The results of trials laid out by local and other agricultural bodies at many experimental stations or farms in Sweden are recorded in detail, but variety trials by plant breeding institutions are not included. A pedigree chart of 2-rowed and 6-rowed barleys of Scandinavian and other barleys is accompanied by a map of agricultural regions in Sweden for use in considering the data regarding yield, earliness, strength of straw, hectolitre weight, 1000 grain weight and crude protein content of the different varieties. A bibliography of Scandinavian literature on barley completes the report.

MILLETS AND SORGHUMS

- 2690 CORRIOLS, J.
 Essai de sélection du mil par une méthode statistique. **(An attempt at millet breeding by a statistical method).**
Bull. Agron. Fr. d'Out. Mer. 1952 : No. 7 : 101-19.

In view of the difficulties of applying pure line selection or Mendelian breeding methods in the improvement of *Pennisetum*, it is suggested that the method of associated character complexes, elaborated by Larroque and here described in full, should be used to save both time and labour (cf. Abst. 1123). The method, which is being applied to the 1952 millet selection programme at the Bambey Research Centre in Senegal, is expected to lead in 1956 to the maximum yield improvement obtainable by this technique.

The statistical method can also be applied to sorghum and maize.

- 2691 PATIL, J. A.
Natural cross-pollination in rala
(*Setaria italica*) Beauv.
Poona Agric. Coll. Mag. 1952-53 : 43 :
151-54.

Under conditions at Niphad, Bombay, natural crossing of a nonpigmented variety with a pigmented one occurred to the extent of 0-1.92%.

- 2692 DIWAKARAN, K., KRISHNA RAO, P. &
KRISHNASWAMY, V.
"Earless," a new Mendelian character
in ragi (*Eleusine coracana*
Gaertn.).
Curr. Sci. 1952 : 21 : 191-92.

The progenies of a single plant selection gave a 3:1 segregation for normal plants and individuals with leafy shoots instead of spikes. Attention is drawn to a similar mutant reported by Sampath and Krishnaswamy in rice, behaving as a simple Mendelian recessive and found to be due to a deficiency of two chromosomes (cf. *PBA*, Vol. XIX, Abst. 994).

- 2693 MARTIN, J. H.
Broomcorn—the frontiersman's cash
crop.
Econ. Bot. 1953 : 7 : 163-81.

This survey of broomcorn production and cultivation in the United States includes sections on botanical features, origin, varieties and breeding.

- 2694 STEVENSON, B.
True strain of Big German millet
sought by Asgrow breeding program.
Sth. Seedsman 1953 : 16 : No. 6 : p. 63.

A true-breeding line of Big German millet, designated SD 52950, has been obtained by single plant selection by the Asgrow Texas Co., San Antonio, Tex.

- 2695 KRISHNASWAMY, N. & RAMAN, V. S.
A note on *Sorghum nitidum* (Vahl)
Pers.
Madras Agric. J. 1953 : 40 : p. 115.

It is pointed out that certain statements in a paper by Rangaswami Ayyangar and Ponnaiya (cf. *PBA*, Vol. XII, Abst. 329) are liable to be misread as implying that *S. nitidum*, assigned to the subsection *Parasorghum*, has a chromosome number of $2n = 10$. These authors had not undertaken chromosome counts of this species. The present writers agree with Garber (cf. *PBA*, Vol. XX, Abst. 2370) in finding that *S. nitidum* has $2n = 20$ chromosomes.

- 2696 HADLEY, H. H.
Cytological relationships between
***Sorghum vulgare* and *S. halepense*.**
Agron. J. 1953 : 45 : 139-43.

Attempts made at Urbana, Ill., to cross *S. halepense* ($2n = 40$) with two varieties of *S. vulgare* ($2n = 20$), namely Sweet Sudan and a male-sterile strain of Texas Blackhull Kafir, resulted in one 40-chromosome and two 30-chromosome hybrids. Cytological observations of pollen mother cells from the parents, their F_1 and F_2 hybrids, and back crosses between 30-chromosome hybrids and *S. vulgare*, show that *S. halepense* behaves more like a segmental allopolyploid than a strongly allopolyploid species. It was noted particularly that the 40-chromosome hybrid had very few bridges or lagging chromosomes at anaphase I. The perennial habit is considered to account for the survival of *S. halepense*, which probably arose as a sterile diploid hybrid between two 20-chromosome ($2n$) species with similar but not wholly identical chromosome complements.

- 2697 MCCAIN, F. S.
Combine Sagrain.
Sth. Seedsman 1953 : 16 : No. 5 : 26, 52.

Shorter stalks and improved lodging resistance are the major characteristics by which Combine Sagrain differs from Sagrain, the variety of sorghum from which it was selected at the Alabama Agricultural Experiment Station. The new variety is particularly suitable for southern Alabama, as its weakly branched and well-aerated seed head is not conducive to attacks by birds, insects or diseases; in this area, yields of Combine Sagrain have been more than twice those of other varieties from 1949 to 1952.

- 2698 LEBEAU, F. J., STOKES, I. E. & COLEMAN,
O. H.
Anthracnose and red rot of sorghum.
Tech. Bull. US Dep. Agric. 1951 :
No. 1035 : Pp. 21.

The bulletin includes a report of tests of different types of sorghum for their reaction to anthracnose leaf spot and red stalk rot, both caused by *Colletotrichum graminicolum*. On the whole the grain sorghums exhibited least susceptibility. Introductions from Africa were quite commonly resistant to anthracnose. In crosses involving three African selections and the American varieties Collier and Leoti, resistance depended on a single factor and was dominant over susceptibility (cf. *PBA*, Vol. XX, Abst. 1658). Inheritance of resistance to red rot is more complex. Certain varieties have exhibited a degree of resistance likely to be of value in breeding.

RICE

- 2699 VASCONCELLOS, J. DE C. E
Formas cultivadas de arroz existentes em Portugal. (**The cultivated forms of rice existing in Portugal**).
Com. Reguladora Comérc. Arroz, Lisboa 1939 : Pp. 107; Apêndice I, 1941 (1951) : Pp. 34; Apêndice II, 1945 : Pp. 20.

The original monograph comprises a full statement of present views on the systematics of rice followed by descriptions of some forty rice varieties found in cultivation in Portugal; a number of further varieties are added in the two appendices.

- 2700 SRINIVASAMURTHY, T.
Improved strains of paddy in Mysore.
Mysore Agric. J. 1953 : 29 : 21-28.

Information is given on the origin and characteristics of 18 rice varieties, and of 5 promising strains still under trial.

- 2701 SILOW, R. A. & KJAER, A.
Report of the Third Meeting of the International Rice Commission's Working Party on Rice Breeding convened by the Food and Agriculture Organization of the United Nations, Bandung, Indonesia, 5-10 May, 1952.
Develop. Pap. FAO, UN, Rome 1953 : No. 30 : Pp. 48.

The FAO international rice hybridization project. (pp. 12-22).

Tabulated data are given concerning 131 crosses already made between *indica* and *japonica* varieties at the Central Rice Research Institute, Cuttack, Orissa (cf. *PBA*, Vol. XXII, Abst. 1939). Many F_1 plants were totally or partially sterile, but fully fertile hybrids were obtained from combinations involving *indica* varieties from Indochina and India.

The world catalogue of genetic stocks of rice. (pp. 25-26).

Attention is drawn to the paucity of breeding stocks registered (cf. *PBA*, Vol. XXII, Abst. 2735), in relation to the material of genetic interest known to be available in various countries.

The world list of plant breeders. (p. 26).
Reference is made to the preparation of this list to facilitate the exchange of information and breeding material (cf. Abst. 1817).

Cooperative research projects. (pp. 27-34).

Information collected from different countries,

with a view to determining possible correlations between morphological characters and susceptibility to lodging, is reviewed. In breeding for lodging resistance, stiff-strawed Burmese varieties form useful parents.

Differential varietal response to application of nitrogen was observed at Cuttack, Orissa, and in Malaya. Certain varieties have proved more sensitive than others to deficiencies of potassium and phosphates in Japan.

Independent studies of photoperiodic response in Ceylon, India, Japan and Malaya provide information on a wide range of varieties. Indonesian bulu rices and some early maturing strains from Ceylon and India were very insensitive to changing photoperiods; for other types, however, short days hastened flowering. In Japan, the interpolation of 24 hours daylight before beginning short-day treatment accentuated the effects of short photoperiods in all varieties except bulu strains from Indonesia. The latter had an exceptionally long period of flowering both in Ceylon and Japan.

- 2702 PIACCO, R.
La razza Carnaroli. (**The variety Carnaroli**).
Riso, Milano 1953 : 2 : No. 4 : 10-11.

The rice variety described, which originated from a cross of Vialone x Lencino, is resistant to lodging, midearly, and gives good yields of pearly grain of the Carolina type.

- 2703 SILVA, M. VIANNA E
Directrizes para o melhoramento do arroz. (**Directions for breeding rice**).
Com. Reguladora Comérc. Arroz, Lisboa 1952 : Pp. 75.

The various features in which it is desirable to improve the existing rice varieties are discussed, and the methods of improvement are described under the headings introduction, selection, hybridization and use or induction of mutants. There follows a report on the results of the rice breeding work in Portugal started in 1941. Observations are now being made on 190 rice varieties and 388 selected lines and a number of hybrids. These include a very early hybrid which is suited to the north of the country and has been named Lusitano, and a variety of the Carolina type which almost equals the common types in yield and has been named Português. An appendix gives a Portuguese translation of the report of the meeting of the rice breeding working party of the International Rice Commission (cf. *PBA*, Vol. XXII, Abst. 1939).

2704 MORINAGA, T.

(Rice breeding in the Meiji era).

Ikushugaku Zasshi/Japan. J. Breeding
1952 : 1 : 261-62. [Japanese].

A short historical review is given of the achievements of Japanese rice breeders in the Meiji era (A.D. 1868-1912).

2705 NISHIMURA, Y., TODA, M., NIIZEKI, H. & OTA, Y.

(The inheritance and differentiation of heading period in rice).

Idengaku Zasshi/Jap. J. Genet. 1950 :
25 : p. 38. (Abst.). [Japanese].

Studies are reported on the length of time required for heading in a series of rice varieties grown under various conditions, with a view to determining satisfactory methods of discrimination. F_1 and F_2 hybrids were raised from intervarietal crosses and indicated that the genetical basis of heading period was complex.

2706 NAGAMATU [NAGAMATSU], T.

(Ecological studies on the differentiation of crop plants. I. On differentiation in respect of earing period in the Asahi strain of rice).

Idengaku Zasshi/Jap. J. Genet. 1947 :
Suppl. 1 : 81-86. [Japanese].

Samples of Asahi [Rising Sun] rice from different localities in Japan were differentiated into ecotypes on the basis of their earing period after early and late sowings.

2707 NAGAO, S. & TAKAHASHI, M.

(Genetical studies on anthocyanin pigmentation in rice. Studies on rice hybridization. VI.).

Idengaku Zasshi/Jap. J. Genet. 1947 :
Suppl. 1 : 1-27. [Japanese].

Pigmentation of the glume depends on three series of genes: (1) C^B , blackish red purple, C^{Bp} , pansy purple or burnt lake, and C^{Br} , rose red, the multiple allelomorphous series determining the type of colour; (2) the gene Sp , necessary for pigmentation to appear in the glumes; and (3) gene Rp , which brings about pigmentation of the entire glume in contrast to rp , which confines the coloration to the apiculus.

Pigmentation of the leaf is brought about by the complementary action of the C and Sp genes together with either Pl (pigmentation of the whole leaf), Pla (pigmentation of the leaf margin and midrib) or Pls (pigmentation of the midrib only). The last-named genes are epistatic in the order $Pl > Pla > Pls$.

Node pigmentation depends on the C and Sp genes together with two complementary factors

Au_1 and Au_2 and a fifth gene which is probably identical either with Pl or Pla .

Grain colour is determined as follows: red $C'Rd$; brown $C'rd$; and white $c'Rd$ or $c'rd$. The dark furrow character is determined by a single recessive gene.

The following linkages are reported: Rd and Sp ; and C , M (endosperm quality) and Pla .

2708 NAGAO, S. & TAKAHASHI, M.

(Studies on rice hybridization. XIV. On the location of some genes belonging to the Pl linkage group).

Ikushugaku Zasshi/Japan. J. Breeding
1952 : 1 : 237-40. [Japanese].

Hybridization studies are reported to elucidate the recombination values and order along the chromosome of the following genes: Pl and Rp , governing the distribution of pigmentation; Ph , for staining of the grain with phenol; lg , for liguleless; and the dwarf genes, d_2 and d_3 . The results suggest the following order: $d_2-d_3-Pl-lg-Ph-Rp$.

2709 HARA, S.

(Linkage between genes for pigmentation and sterility in rice).

Idengaku Zasshi/Jap. J. Genet. 1947 :
Suppl. 1 : 47-50. [Japanese].

This paper is the full version of that summarized already in *PBA*, Vol. XXII, Abst. 411.

2710 KATAYAMA, Y. & YOSHIDA, S.

(The genetics of a variegated rice).

Idengaku Zasshi/Jap. J. Genet. 1950 :
25 : 33-34. (Abst.). [Japanese].

Observations on the morphology and inheritance of a variegated rice strain are reported. The data at present available suggest that plastid mutation is involved.

2711 JODON, N. E.

Louisiana releases Sunbonnet through Seed Growers Assn.

Rice J. 1953 : 53 : No. 3 : p. 40.

Developed at the Rice Experiment Station, Crowley, La., Sunbonnet is a selection of Bluebonnet (Rexoro x Fortuna). Compared with its parent, it has the advantages of greater resistance to *Cercospora* leaf spot, slightly higher yielding capacity, the production of better stands and improved milling quality.

2712 HIRAYOSHI, K.

(Secondary pairing in PMC of *Zizania latifolia*).

Idengaku Zasshi/Jap. J. Genet. 1950 :
25 : p. 21. (Abst.). [Japanese].

Data are provided on the frequency of secondary

pairing between chromosomes of different sizes in pollen mother cells of *Z. latifolia*; it is thought likely that this secondary pairing is due to homology within the chromosome complement.

- 2713 MELLO SAMPAYO, T. J.
Um caso de variação estrutural em *Oryza sativa* L. (A case of structural variation in *O. sativa* L.).
Com. Reguladora Comérc. Arroz, Lisboa 1952 : Pp. 14.

Although sterility is more common in crosses between the taxa *japonica* and *indica*, it occurs occasionally also in crosses within either of these taxa, and a description is given of a hybrid of Allorio x Mamoriaka Ailé 0112A, both forms of subsp. *japonica*, in which only 54% of the spikelets are fertile. Cytological studies revealed 24 chromosomes which behaved regularly up to metaphase I; the presence of an acentric fragment was revealed at anaphase I, where a chromatid bridge was observed in one pair of chromosomes. The homeotypic division was regular but the loss of the fragment is thought to be sufficient to account for the sterility observed. (Cf. Abst. 2715).

- 2714 MORINAGA, T. & KURIYAMA, H.
(On the progeny of spontaneously occurring sterile rice caused by structural hybridity).
Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : 26-27. [Japanese].

The cause of a stray occurrence of semisterility in a rice field has been traced to structural hybridity. Meiosis in the structural hybrid is described, also the frequency of cytological offtypes in the offspring that the authors managed to obtain.

- 2715 MELLO-SAMPAYO, T.
An inversion occurring in an F_1 hybrid between two strains of "*Oriza sativa*" L.
Genet. Iber. 1952 : 4 : 43-45.

A high degree of sterility (54%) was noted in the F_1 of a cross between two *japonica* rices, Allorio and Mamoriaka Ailé 0112A, at the National Station of Agronomy, Portugal. Chromatid bridges and acentric fragments, resulting from crossing over within a paracentric inversion, were found at anaphase I in pollen mother cells. Subsequent elimination of the acentric fragments is considered to be responsible for the nonviability of gametes and the observed sterility. (Cf. Abst. 2713).

- 2716 LUONG DINH CUA
II. Fertile tetraploids of *japonica* x *indica* in rice.

Proc. Imp. Acad. Japan 1951 : 27 : 43-48.
Colchicine-induced tetraploids of hybrids between vars. *japonica* and *indica* of *Oryza sativa* are much more fertile than the corresponding F_1 diploids (cf. Abst. 1220). Such tetraploids are regarded as valuable either as a source of new variants or for crossing with other induced tetraploids.

- 2717 CHANDRARATNA, M. F.
A gene for photoperiod sensitivity in rice linked with apiculus colour.
Nature, Lond. 1953 : 171 : 1162-63.

The day-neutral Ceylonese variety Vellai Ilankalayan 28061 was crossed with two photoperiodically sensitive varieties from Burma, MLYC 401 and HMC 12, at Peradeniya, Ceylon. F_1 and F_2 data indicated that sensitivity is monogenically determined and completely dominant to the neutral reaction. The gene pair for photoperiodic reaction was linked with that for apiculus colour, *Apap*.

- 2718 SYAKUDO [SHAKUDO], K., TOMINAGA, M., KAWASE, T. & HAYASHI, K.
(Studies on quantitative inheritance. VIII. A. Rice. a. Studies on the inheritance of panicle length and on the quantitative effect of the genes controlling it. 4. On the quantitative effect of 2 genes affecting panicle length and 1 gene, D_1 , responsible for dwarf habit).
Ikushugaku Zasshi/Japan. J. Breeding 1952 : 1 : 254-60. [Japanese].

This paper is the full version of that already summarized in Abst. 1224.

- 2719 SYAKUDO [SHAKUDO], K.
[Studies on quantitative inheritance. I. A. Rice. (a) Studies on the inheritance of the quantitative function of the genes determining ear length in rice. 1. On the quantitative function of the gene P_1).
Idengaku Zasshi/Jap. J. Genet. 1947 : Suppl. 1 : 28-37. [Japanese].
SYAKUDO [SHAKUDO], K.
[Studies on quantitative inheritance. II. A. Rice. (b) Studies on the inheritance of and quantitative function of the genes determining culm length in rice. 1. On the quantitative function of the gene H_1).
Ibid. 1947 : Suppl. 1 : 38-46. [Japanese].

Full versions are given of the articles sum-

marized already in *PBA*, Vol. XXI, Absts. 2691 and 2689 respectively.

2720 SYAKUDO [SHAKUDO], K.

[On the inheritance of panicle length in rice and the quantitative function of the genes determining it. (Studies on quantitative genetics. V.)].

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : p. 37. (Abst.). [Japanese].

Continuing his work on the genetics of panicle length in rice (cf. *PBA*, Vol. XX, Abst. 1679), the author analyses the effect on panicle length of the various genes distinguishing varieties Henei ($Cp_2P_2P_3P_3glglK_aK_bK_b$) and Dairyu ($CP_2P_2P_3P_3GlGlK_aK_bK_b$), whose hybrid progeny have been studied in the F_1 - F_6 . C represents the fundamental gene complex mentioned in the author's earlier papers.

2721 (On differences in awning in rice). Ikushugaku Zasshi/Japan. J. Breeding 1952 : 1 : p. 232. [Japanese].

After a brief review of the genetical and cytological basis of awning in rice, observations are reported on the presence of awns in normally unawned varieties that came into ear from the aftermath.

2722 SANJIVA RAO, B., VASUDEVA MURTHY, A. R. & SUBRAHMANYA, R. S.

The amylose and the amylopectin contents of rice and their influence on the cooking quality of the cereal.

Proc. Indian Acad. Sci. 1952 : 36 : Sect. B : 70-80.

Variations in the extent of swelling of rice grains during cooking are shown to be correlated with amylose content, which is highest in varieties of good cooking quality.

2723 SAKAI, K.

(Cytohistological and plant breeding studies on sterility in rice due to injury from cold weather, with special reference to experimental studies on hypertrophy of the tapetum due to low temperature).

Hokkaido Nogyo Shiken Jo Hokoku/Rep. Hokkaido Agric. Exp. Sta. 1949 : No. 43 : 1-46. [Japanese].

A type of male sterility whose proximate cause is tapetal hypertrophy brought about by low temperatures occurs in Hokkaido. Varietal differences in the tendency towards tapetal hypertrophy have been detected, and a positive correlation has been noted between the extent of hypertrophy and the varietal susceptibility to injury by cold weather.

2724 CHIAPPELLI, R.

Al campo sperimentale la varietà Stirpe 82. (The variety Strain 82 in the experimental field).

Riso, Milano 1953 : 2 : No. 6 : p. 15.

The variety described, a selection from a natural hybrid of Lady Wright x Chinese Ostiglia, surpasses Americano 1600 in standing capacity, is vigorous in growth and free from brusone and other diseases, and yields up to 80 q. per ha. in the Bologna area.

2725 YOSHII, H. & MATSUMOTO, M.

(Studies on the resistance of foreign rice varieties to *Ophiobolus Miyabeanus*. I.).

Matsuyama Noka Daigaku Gakujutsu Hokoku/Sci. Rep. Matsuyama Agric. Coll. 1951 : No. 6 : 25-60. [Japanese].

Out of 20 introduced varieties, Yin-nien (Chinese) and Tetep (Southeast Asiatic) were highly resistant; and Bomba and Tadukan (Southeast Asiatic), Jamaica and Louisiana Beardless (American), and Chang-hsiang and Szu-mao-chih (Chinese), considerably resistant to *O. Miyabeanus* (= *Helminthosporium Oryzae*). Resistance appears to be associated either (1) with failure of the cells to become constricted after infection and the presence of narrow intercellular spaces, or (2) with the presence of an acetone-soluble substance inhibiting fungal development.

2726 SHIGEMURA, T.

(On breeding a variety resistant to blast).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : 36-37. (Abst.). [Japanese].

An attempt is being made to breed a rice variety resistant to *Piricularia Oryzae* by hybridizing and back crossing susceptible Japanese varieties with resistant types from other countries. Resistant types were recovered in the later back crosses, resistance being apparently determined by several genes. An association, presumably due to linkage, was noted between resistance and unsatisfactory panicle and grain characters.

2727 BARREIROS, H. A.

Melhoramento do arroz. (Breeding rice).

Gaz. Agric. Moçamb. 1953 : 5 : 34-38.

Several hundred rice varieties are at present being cultivated in Moçambique. Tests of 11 varieties in 1949-51 showed the best to be Chinchica and Faia, thought to be synony-

mous, and India. Tests were also carried out on spacing and time of sowing.

- 2728 JONES, J. W., ADAIR, C. R., BEACHELL, H. M., JODON, N. E. & WILLIAMS, A. H. **Rice varieties and their yields in the United States 1939-50.**
Circ. U.S. Dep. Agric. 1953 : No. 915 : Pp. 28.

Results of variety tests on rice grown in the USA from 1939 to 1950 are given, together with the characteristics of each variety, such as yield, average date of maturity, milling quality and resistance to disease.

- 2729 GRAHAM, T. G. & LITTLER, J. W. **Upland rice growing in Queensland.**
Qd Agric. J. 1953 : 76 : 125-38.

An account is included of trials carried out by the Bureau of Tropical Agriculture to study the suitability of rice varieties of different origins for growing under upland conditions in north Queensland. The following are the most promising so far tested: Speculation, Mekeo, Tribulation, Prelude and Early Niro.

OTHER CEREALS

- 2730 YAMAURA, A. **(Genetical studies in the genus *Coix*. I).**
Idengaku Zasshi/Jap. J. Genet. 1949 : 24 : 180-82. [Japanese].

By intercrossing three varieties of *C. Lachryma-Jobi* the following genes have been recognized: *S s* for starchy *vs.* sugary endosperm; *Pu₁* and *Pu₂* for purple leaf sheath; *R* for red stigma; and *Iv_t*, *Iv_l* and *Iv_m* for grain morphology. The genotypes of the varieties studied were: var. *frumentacea*, *Pu₁ Pu₂ R s Iv_t*; var. *typica* f. *Susutama*, *S Iv_t*; and var. *maxima*, *S Iv_m*.

FORAGE GRASSES

- 2731 REBISCHUNG, J., FÉLIX, L., THOMAS, M., DEMARLY, Y. & KERGUELEN, M. **Comportement de deux espèces de graminées fourragères exploitées suivant des rythmes différents. (The behaviour of two species of forage grasses grown in accordance with two different rhythms).**
Ann. Inst. Nat. Rech. Agron., Paris 1952 : 2 : Sér. B : 473-506.

Dactylis glomerata and *Arrhenatherum elatius* material that had survived a severe rust epidemic and the 1946-47 winter were used as

mother plants for the production of strains whose possible adaptation to cultivation for pasture or for hay was studied by the Central Station for Genetics and Plant Breeding, France.

The two species differed in their reaction to the two systems of exploitation and plants within the species also differed in their response to the two treatments.

- 2732 REEDER, J. R. **Affinities of the grass genus *Beckmannia* Host.**
Bull. Torrey Bot. Cl. 1953 : 80 : 187-96.

The results of histological analyses of the embryo lend support to the view that the tribe Chlorideae should be removed from the subfamily Festucoideae and included in the Panicoideae. Embryo studies, the anatomy of the epidermis and leaf, and the chromosome number ($2n = 14$) of *Beckmannia* suggest that this genus should be ascribed to the Agrostideae.

- 2733 PARODI, L. R. **Gramineas argentinas nuevas o críticas. II. (New or critical Argentine gramineous species. II).**
Rev. Argent. Agron. 1953 : 20 : 11-30.

Ten further new gramineous species for Argentina are described, five of them being of South American origin, and certain corrections are made in the nomenclature of others (cf. *PBA*, Vol. XVIII, Abst. 2275).

- 2734 MEINERS, J. P. & FISCHER, G. W. **Further studies of host specialization in the head smut of grasses, *Ustilago bullata*.**
Phytopathology 1953 : 43 : 200-03.

At the State College of Washington, four new races of *U. bullata* have been identified, in addition to the eight races whose occurrence was reported in 1940. The number of differential grass species has been reduced from 14 to 11. Studies in which both paired monosporidial lines and spores were used for inoculation indicated that the response of the differential species to smut collections varied from year to year, regardless of the purity of the inoculum; the limits of racial differentiation have therefore been broadened to allow for such host variability.

- 2735 HIESEY, W. M. **Growth and development of species and hybrids of *Poa* under controlled temperatures.**
Amer. J. Bot. 1953 : 40 : 205-21.

The results of this investigation of the response to controlled day and night temperatures at the

Earhart Laboratory, Pasadena, Calif., have already appeared in reports of the Department of Plant Biology, Carnegie Institution (cf. Abst. 1605).

2736 LEFFEL, R. C.

Fertility, parent-progeny, and progeny test comparisons of selected clones of orchardgrass, *Dactylis glomerata* L.

Iowa St. Coll. J. Sci. 1953 : 27 : 209-10.

Investigations on fertility, agronomic performance and combining ability in 19 clones are reported.

The parental clones differed in all the characters studied except date of blooming. Early spring vigour, panicle production, forage yield, recovery after first cutting and leafiness were positively associated with one another, and negatively correlated with date of blooming and leaf width. Single crosses differed significantly in early spring vigour, date of blooming, number of panicles, disease susceptibility and green forage yield, but significant differences among polycrosses existed only for disease susceptibility and date of blooming, and among top crosses only for the latter character. Parent-progeny associations were usually positive but not of sufficient magnitude to forego progeny testing. Correlations between mean single cross and polycross performances were in general the highest of the interprogeny associations, and ranged from 0.40 for early spring vigour to 0.86 for disease susceptibility. Genetic variation among clonal polycross means was relatively small compared with environmental variation. Correlations of self or cross fertility of parental clones with either their vigour, as measured by panicle number and green forage yield, or their combining ability in single cross, polycross and topcross tests, were not significant. In studying general combining ability an increase in number of testers was more efficient than increase in number of replications. Ten testers should provide complete information concerning the mean variance of general combining ability.

2737 CLARKE, M. F.

A study of the carotene and crude protein content of orchardgrass (*Dactylis glomerata* L.). I. Variation due to stage of growth, cutting management and clones.

Canad. J. Agric. Sci. 1953 : 33 : 184-94.

The relative content of protein and carotene at different growth stages was similar in each of ten clones, representing early and late maturity classes, at the US Regional Pasture Research

Laboratory, State College, Pa. Variations with stage of growth and sampling techniques, however, emphasize the need for rigidly defining the conditions under which clones are to be compared prior to selection in breeding programmes.

2738 VESTAD, R.

Norske timoteistammer og stammeforsøk i de forskjellige landsdeler. (Norwegian timothy strains and strain trials in the different parts of the country).

Forskn. Fors. Landbr. 1953 : 4 : 55-78.

The results of regional strain trials at Norwegian experimental centres, including Vollebekk, Møystad, Vidarshov, Løken and Forus, are recorded in detail. The material tested comprised 24 Norwegian local strains, as well as some Finnish, Swedish and American varieties. In southern Norway the best Finnish and Swedish strains equalled the Norwegian, but in northern Norway, the best local strains did better than Finnish timothy, which surpassed that from Sweden or southern Norway. Bodin, Leite and Engmo are mentioned as good strains, the first two being from Nordland and the last from Troms.

The Institute of Genetics and Plant Breeding is collecting information on Norwegian strains in the country and many are being tested in the breeding programme begun at the Farm Crop Institute of the Agricultural College of Norway.

2739 COOPER, J. P.

Genetic control of inflorescence development in *Lolium*.

Heredity 1953 : 7 : p. 152. (Abst.).

In crosses between *L. rigidum* of Mediterranean origin and *L. perenne* from northwestern Europe, response to both low temperature and photoperiod, in respect of heading, shows polygenic control. Each outbreeding population of *L. rigidum* or *L. perenne* is phenotypically uniform in respect of heading under conditions for which it is selected, but its genetic variability is revealed in environments of critical threshold temperature or photoperiod, when heading and nonheading individuals appear. No such genetic diversity is found within single lines of the inbreeding species *L. temulentum*.

2740 CROWDER, L. V.

A survey of meiotic chromosome behavior in tall fescue grass.

Amer. J. Bot. 1953 : 40 : 348-54.

A hexaploid chromosome complement ($2n = 42$) was found in 247 plants of diverse origin maintained under greenhouse conditions at the Georgia Experiment Station. Three plants had

a small extra chromosome with a median centromere; these supernumeraries behaved as laggards at anaphase I and micronuclei at telophase I, but their subsequent behaviour was obscured by the presence of additional lagging univalents. At metaphase I 99% of the chromosomes occurred as bivalents, 0.7% as univalents and 0.3% as multivalents. The low incidence of multivalents indicated some degree of homology between genomes; behaviour was, however, typical of neither an allohexaploid nor an autohexaploid. Occasional multivalent formation provides an opportunity for genic exchange between genomes.

High correlation coefficients indicated that univalents were the main cause of laggards and micronuclei observed in 5.5% of the microspores. However, since 13% of the pollen aborted, micronuclei were apparently not solely responsible.

2741 PANOV, I.

(A high-yielding variety of Sudan grass).

Kolhoznoe Proizvodstvo (Collective Farming) 1952 : No. 4 : p. 59. [Russian].

Odessa 25 is described as an early, drought-resistant variety giving 2-3 cuts a season, with rapid aftergrowth and high yields of green matter and of seed. Hay yields varying from 50 to 55 c. per ha. are reported for it from collective farms.

2742 GOULD, F. W.

A cytotaxonomic study in the genus *Andropogon*.

Amer. J. Bot. 1953 : 40 : 297-306.

Cytological and morphological data indicate that the section *Amphilophis* is represented in North America by at least nine taxa, forming a euploid series. *Andropogon Edwardsianus*, *A. exaristatus* and one type of *A. saccharoides* are hexaploids with $2n = 60$; *A. perforatus*, the other type of *A. saccharoides* and two taxa, RF 70 and RF 402, have $2n = 120$, and both types of *A. barbinodis* have $2n = 180$. It is suggested that crosses between the three hexaploid taxa have given rise to the higher polyploids, with the exception of *A. barbinodis*, which may have arisen from the cross RF 70 x *A. Edwardsianus*, followed by chromosome doubling.

2743 ZERPA, D. M. DE

Número cromosómico de *Brachiaria decumbens*. (Chromosome number of *B. decumbens*).

Agron. Trop., Venezuela 1952 : 2 : p. 215.

The number $n = 18$ was counted in meiotic metaphases.

2744 GARDÉ, A.

Sur la caryologie de l'*Airopsis tenella* (Cav.) Coss. [On the caryology of *A. tenella* (Cav.) Coss].

Broteria 1951 : 20 : 35-37.

The chromosome number $2n = 8$ for *A. tenella* is confirmed and the morphology of the individual chromosomes is described.

2745 BEDDOWS, A. R. & JONES, K.

Chromosome numbers in *Holcus mollis*.

Nature, Lond. 1953 : 171 : 938-39.

F_1 hybrids of *H. lanatus* and *H. mollis* have exhibited male sterility, with only 1-20% stainable pollen. The chromosome number in 23 of these hybrids ranged from $2n = 21$ to 42. *H. lanatus* and the *H. mollis* parent had $2n = 14$ and 35 chromosomes, respectively. A survey of both species revealed the existence of $4n$, $5n$ and $6n$ forms of *H. mollis* and confirmed the diploid nature of *H. lanatus*. The pentaploid form of *H. mollis* is the most frequent, and in some areas at least it coexists with the $4n$ and $6n$ types.

2746 BURBRIDGE, N. T.

The genus *Triodia* R.Br. (Gramineae).

Aust. J. Bot. 1953 : 1 : 121-84.

The possible economic importance, distribution and diagnostic characters of *Triodia* species in Australia are described. Interspecific and intergeneric relationships are discussed; the view is expressed that the genus belongs to the Danthonieae rather than to the Eragrosteae. Descriptions of species and varieties are provided, together with an identification key.

LEGUMINOUS FORAGE PLANTS

2747 SAKAI, B.

(Studies on the caryotype of some leguminous plants).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : p. 17. (Abst.). [Japanese].

Caryotype formulae are given to summarize the chromosome morphology of *Rhynchosia volubilis*, *Pueraria Thunbergiana*, *Lespedeza pilosa* and *Kumerowia striata*.

2748 PROCHAZKA, F.

Přsobení incestu, insuchtu a heterosis u vojtěšky. (The effects of selfing, inbreeding and heterosis upon lucerne).

Za Socialist. Zeměd. 1953 : 3 : 284-92.

A productive lucerne population was developed

from F_4 inbreds and F_4 intravarietal hybrids of *Medicago sativa* and the hybrids between the inbreds $\times$ *M. falcata* and intravarietal hybrids $\times$ *M. falcata* in the foothills of the Železny Mountains.

2749 LESINS, K.

Some data on the cytogenetics of alfalfa.

J. Hered. 1952 : 43 : 287-91.

This paper is a more detailed version of that summarized in Abst. 1256.

2750 BIANCHI, A. & FORLANI, R.

Erbe mediche di diversa provenienza. (Lucernes of various provenance).

Genet. Agr. 1953 : 3 : 215-34.

Lucerne plots arising from seed from seven different localities in Italy were studied in the vicinity of Lodi in North Italy. The best yields were obtained from local material except in certain exceptionally well-situated plots, where the local populations were outyielded by at least two from elsewhere; these are thought to represent promising material for crossing with the local strains.

2751 PEDERSEN, M. W.

Preliminary studies on breeding alfalfa for seed production in Utah.

Agron. J. 1953 : 45 : 179-82.

Over a period of three years at Logan, Utah, yields of hay from polycross progenies of 18 lucerne clones were not significantly correlated with seed yields or degree of self and cross fertility of the parents. Seed yields of the progenies were, however, correlated with cross fertility ($r = +0.4840$) and seed yield ($r = +0.6144$) of the parent clones. The wide range of self fertility in the parents had no apparent influence on the hay or seed yields of progenies. Cross fertility, however, seems to be desirable for seed production. Nine selections, made on the basis of the performance of the maternal parent, gave seed yields averaging 38.8% more than the average of six commercial varieties, without loss of forage productivity.

2752 **Synthetic alfalfa under test.**

What's New Crops Soils 1953 : 5 : No. 8 : p. 29.

Nevada Syn-A, a synthetic strain obtained by combining several varieties of lucerne, is being tested cooperatively by the US Department of Agriculture and the Nevada Agricultural Experiment Station. It has shown resistance to stem nematode and bacterial wilt.

2753 WILSON, M. C. & DAVIS, R. L.

Varietal tolerance of alfalfa to the meadow spittlebug.

J. Econ. Ent. 1953 : 46 : 238-41.

In experiments at Purdue University Agricultural Experiment Station, Ind., selections of lucerne have shown different degrees of tolerance of injury caused by *Philaenus leucophthalmus*, and of attractiveness for this pest. The data suggest that selections C53, C 51 and C 40, and possibly C 59, are highly tolerant.

2754 DAVIS, R. L. & WILSON, M. C.

Varietal tolerance of alfalfa to the potato leafhopper.

J. Econ. Ent. 1953 : 46 : 242-45.

Lucerne selections studied at the Purdue University Agricultural Experiment Station, Ind., have varied in their tolerance of *Empoasca fabae* and attractiveness for this pest. Selections C 40, C 59, C 10 and A 204 exhibited a high degree of tolerance; other selections appeared to be unattractive to the insect, since they had low ratings for damage, associated with small populations.

2755 TESAR, M. B.

Red clover varieties for Michigan.

Quart. Bull. Mich. Agric. Exp. Sta. 1953 : 35 : 351-58.

Information is given on the yielding ability and susceptibility to northern anthracnose (*Kabatella caulivora*) shown by red clover varieties tested in the southern and northern areas of the Lower Peninsula of Michigan. Dollard and Ottawa exhibited the least susceptibility.

2756 KORSTEN, L. H. J.

Een nieuwe methode voor bepaling van de vatbaarheid van klaverplanten voor het stengelaaltje [*Ditylenchus dipsaci* (Kuhn) Filipjev]. [A new method for testing the susceptibility of clover plants to the stem eelworm, *D. dipsaci* (Kuhn) Filipjev].

Tijdschr. PlZiekt. 1953 : 59 : 27-28.

This method for the use of breeders makes large-scale determinations possible. The clover is sown in boxes of sterilized soil and the resultant seedlings are sprayed with a concentrated suspension of eelworms in water and then put in a room at 15-20°C with high atmospheric humidity. The symptoms are clearly exhibited two weeks after inoculation.

- 2757 HODJKOV, L. E. & KNJAZEVA, R. N.
(The biology of pollination of red clover).
 Agrobiologija (Agrobiology) 1953 : No. 1 : 76-80. [Russian].

Mention is made of a hybrid clover which out-yields the selected variety Sivorickii 4/6 in the Leningrad province. It was obtained from a cross between a local and a Canadian form.

- 2758 **New red clover suited to Alaska conditions is released to farmers.**
 What's New Crops Soils 1953 : 5 : No. 8 : p. 27.

A winter hardy variety, Alaskland, believed to be a descendant of three Russian strains planted in 1929 at the Fairbanks Experiment Station, Alaska, is recommended for local conditions, where it has yielded 2 tons of dry matter per acre as a biennial.

- 2759 DADAY, H.
Distribution of gene frequencies in *Trifolium repens* L.
 Heredity 1953 : 7 : p. 151. (Abst.).

In wild populations of *T. repens* in Europe and the near East, variation was observed in the relative proportions of four phenotypes, distinguishable on the basis of cyanogenetic glucoside and enzyme content. From south to northeast, the frequency of dominant genes determining glucosides and enzymes showed a gradual decrease, correlated with January isotherms.

- 2760 GIBSON, P. B. & SCHULTZ, E. F.
The effect of environment on the number of vascular bundles per petiole in white clover.
 Agron. J. 1953 : 45 : 123-24.

In a hot and dry environment Ladino clover had the same mean number of vascular bundles per petiole as other types of white clover in cool moist conditions, thus indicating that vascular bundle counts are not reliable criteria for identifying Ladino clover (cf. *PBA*, Vol. XXII, Abst. 2005).

- 2761 RONNINGEN, T. S.
Susceptibility to winter injury and some other characteristics in Ladino and common white clovers.
 Agron. J. 1953 : 45 : 114-17.

On the hill farms of the Wisconsin Experiment Station, highly significant negative correlations were noted between winter injury and plant

vigour. It is probable that the common white clover, generally possessing greater winter hardiness than Ladino clones, represented a longer period of selection under severe winter conditions. Small white plants appearing among Ladino progenies, however, also showed superior winter hardiness. Thus the possible occurrence of linkage between heritable factors for size and winter hardiness is discussed; finely branched stolons having numerous roots in contact with the soil and protective leaf cover contribute largely towards the survival of common white strains. Since the hardiness of the latter was equalled by a few Ladino clones, some valuable winter hardy Ladino selections may be obtained.

- 2762 KNIGHT, W. E.
Interrelationships of some morphological and physiological characteristics of Ladino clover.
 Agron. J. 1953 : 45 : 197-99.

From the polycross nursery at State College, Pa., 11 clones with a wide range of variability in such characters as stolon diameter, leaf size and internode length were selected for crossing in all possible combinations. Multiple and partial correlation coefficients for parents and F_1 progenies in greenhouse and replicated field experiments showed that number of stolons was the most reliable criterion of persistence. Clones with large numbers of stolons and relatively small stolon diameters were generally capable of surviving winter injuries. Selection for improved persistence should not, therefore, be difficult.

- 2763 BROCK, R. D.
Species formation in *Trifolium subterraneum*.
 Nature, Lond. 1953 : 171 : p. 939.

The author's study of collections of *T. subterraneum* confirms the report by Yates and Brittan (cf. Abst. 424) that the Israel variety has $2n = 12$ chromosomes, whereas varieties from other countries have $2n = 16$. The Israel variety represents a new basic number, $x = 6$, for the tribe Trifolieae, and is characterized by a general increase in chromosome size and by long chromosomes not present in other collections. It is suggested that the reduction in number arose as a result of rearrangement. On the basis of its failure to cross with other types and its difference in chromosome number, the Israel variety should be recognized as a cryptic species.

2764 LECHNER, L.

Die "Weissblühende Winterwicke" im Lichte neuerer Erfahrungen. (**The white-flowering hairy vetch in the light of recent experiences**).
Saatzgutwirtschaft, Stuttgart 1953 : 5 : 150-53.

The writer gives an historical survey of *Vicia pannonica*. Its disadvantage in the past lay in the hardness of its seed, but this has been overcome by selective breeding and now applies only to uncertified seed of foreign origin.

V. pannonica is valuable as a source of early green fodder for cattle and of silage in the event of a dry summer. It is preferable to *V. villosa* in that it may be harvested some 8 days earlier, is easier to harvest after luxuriant growth caused by heavy rains, and produces more seed.

2765 HIRAYOSHI, I. & MATSUMURA, M.
(**Cytogenetical studies on forage plants. I. Chromosome behaviour and fertility in the F_1 of common vetch x Japanese wild vetch**).
Ikushugaku Zasshi/Japan. J. Breeding 1952 : 1 : 219-22. [Japanese].

European vetch (*Vicia sativa*) has $2n = 12$ chromosomes. The wild Japanese vetch, usually referred to the same species, has $2n = 14$ chromosomes. In the F_1 hybrids, meiosis is irregular, the commonest configuration being $1_{IV} + 4_{II} + 1_I$, but multiple associations involving as many as 12 chromosomes also occur. Sterility is high. These data throw doubt on the propriety of including the Japanese wild vetch in *V. sativa*.

2766 HANSON, C. H.
***Lespedeza stipulacea*: stamen morphology, meiosis, microgametogenesis, and fertilization.**
Agron. J. 1953 : 45 : 200-03.

Data reported from observations of chasmogamous and cleistogamous flowers at Raleigh, NC, provide evidence that fertilization occurs in this species; these results should, therefore, encourage varietal improvement by hybridization.

2767 HANSON, C. H., ALLISON, J. L. & CHAMBLEE, D. S.
The performance of lespedeza strains on North Carolina soils infested with root-knot nematodes.
Agron. J. 1953 : 45 : 143-46.

Data concerning the forage yield and incidence

of root knot infection for 16 strains of *Lespedeza striata* and *L. stipulacea*, including Korean, Kobe and Climax, grown at Willard, NC, are presented to show that strains differ significantly in respect of nematode resistance. These results, supplemented with information from trials in four other parts of the state, have led to the release of a resistant strain of *L. stipulacea*, FC 31480-43, which has been named Rowan (cf. *PBA*, Vol. XXII, Abst. 481).

2768 CHANDRA DAS, B.
Cytology of megasporogenesis as a basis for sterility in autotetraploid sweetclover, *Melilotus alba*.

Iowa St. Coll. J. Sci. 1953 : 27 : 153-54.

Study of megasporogenesis in colchicine-induced tetraploids indicated that various irregularities in divisions I and II of meiosis, chiefly lagging and exclusion of chromosomes, resulted in the development of unbalanced gametes and sterility. The level of sterility was apparently correlated with the degree of meiotic irregularity, suggesting that selection for higher fertility should be possible. The hypodermal cells from which the sporocyte is derived also exhibited mitotic irregularities.

2769 SANDAL, P. C. & JOHNSON, I. J.
Mechanisms of self- and cross-incompatibility in sweetclover, *Melilotus officinalis* Lam.
Agron. J. 1953 : 45 : 96-101.

Self and cross compatibility relationships determined at Ames, Ia., from random samples of Madrid sweet clover, their S_1 and S_2 progenies, and test crosses within S_1 progenies and between S_1 and S_0 clones suggest that sterility is controlled by more than one pair of modifying factors in addition to oppositional factors of the *S* allelic series (cf. *PBA*, Vol. XIV, Abst. 1242). S_1 progenies from S_0 clones of low fertility showed a tendency for skewness towards a low degree of self compatibility, whereas the S_1 from S_0 clones of high fertility had a skewed distribution towards a high degree of self compatibility. Since some self-incompatible plants were found in all S_1 and S_2 progenies, it is suggested that all S_0 clones carry similar genes, S_xS_y , for low compatibility, but differ in respect of modifier genes, *Aa* or *Bb*, for higher degrees of self compatibility. The modifiers are inherited independently of the *S* locus. Thus homozygous recessive modifiers give the oppositional type of incompatibility, while increasing numbers of dominant alleles induce a corresponding increase in the degree of self compatibility.

- 2770 HACKBARTH, J.
Züchtung und Anbau der weissen Lupine (*Lupinus albus*). [**Breeding and cultivation of white lupin (*L. albus*)**].
Mitt. dtsch. LandwGes. 1953 : 68 : 453-55; 479-81.

On account of its strong growth, high yield of thin-skinned seeds, and freedom from shedding, *L. albus* attracted attention from early times and the first attempts to select forms early enough to ripen in Germany are described. Forms with up to 17% oil in the seed have been selected, higher oil contents being found only in plants with late maturity. Early maturing sweet white lupins have been produced by hybridization and two varieties are now on the market, namely Gela and Ultra, which ripen in late August or early September. Other forms under investigation include still earlier types, a small-seeded form and some which are taller and somewhat later but give higher yields of green matter.

In some general remarks on the cultivation of white lupins it is stated that the varieties now available produce some 7.5 metric centners of protein and 2.2 c. of fats per ha. as compared with 6.25 c. protein from field beans on the same land.

- 2771 KRESS, H.
Ergebnisse der Röntgenbestrahlung bei der Gülzower Süssen Gelblupine (*L. luteus*). [**Results of X irradiation on the Gülzow Sweet yellow lupin (*L. luteus*)**].
Züchter 1953 : 23 : 168-72.

The most successful dose of X-irradiation was between 12 and 16 kr. In the first experiment, hairless pods, floral pigmentation and chlorophyll mutants were produced, but these proved to be periclinal chimeras.

The second experiment was carried out on seeds of plants already subjected to X rays. The mutants produced included short-haired pods, plants in which the pod hairs were quickly lost under normal weather conditions, pigmentation mutations of the flower and seed, a mutant with smaller pods and seeds than the parent plant but giving the same yield per unit area, plants with cleistogamous flowers, and sterile plants with aberrant leaves.

ROOTS AND TUBERS

- 2772 Fodder beet variety trials.
Mon. Rep. Minist. Agric. N. Ire. 1953 : 27 : 332-34.

The three varieties Hunsballe X, Pajbjerg Rex X

and Red Øtofte, all gave good yields of roots at various trial centres in Co. Down, N. Ire., during 1952 (cf. *PBA*, Vol. XXII, Abst. 2018).

- 2773 JÄHNEL, G.
Ergebnisse der Rübenversuche des Jahres 1952. (**Results of beet tests during 1952**).
VersErgebn. Bundesanst. alp. Landw., Admont 1953 : No. 21 : Pp. 53. (Mimeographed).

Among the sugar beets Beta 242/55 and Buszinsky again gave the highest yields. Of varieties grown for cattle feeding, Zentauro produced the greatest yields of root, dry substance and sugar.

Semi-sugar beet varieties such as Zentauro, Ovana, Rosa Beta, Slättbo, Sörrimer and Regia produced the highest yields for cattle feeding purposes.

Weisse Schmalz produced abundant foliage, but the crop failed completely. It is not recommended for the Alpine area.

- 2774 HÖSSLIN, R. v.
Der Einfluss der Standweite auf die Bildung zylindrischer Knollenformen des Kohlrabi. (**The influence of spacing on the formation of cylindrical root shape in kohlrabi**).
Züchter 1953 : 23 : 134-36.

Close planting was found to lead to elongated roots similar to those formed in plants about to bolt. Suitable spacing is therefore important in making selections or varietal comparisons in respect of root shape.

- 2775 *HARTMAIR, V.
Ergebnisse der Gemüsesortenversuche des Jahres 1951. (**Results of vegetable variety trials for the year 1951**).
VersErgebn. Bundesanst. alp. Landw., Admont 1952 : No. 18 : Pp. 36. (Mimeographed).

The results of variety tests for kohlrabi, beetroot, carrots, radishes, cabbages, cauliflowers, lettuce and peas are given.

- 2776 PALMER, T. P.
Resistance of swedes to aphids. I. Resistant varieties.
N.Z. J. Sci. Tech. 1953 : 34 : Sect. A : 553-55.

A trial was carried out on the resistance of 45 varieties to *Brevicoryne brassicae*, at Lincoln,

* An extended summary of this paper is on file at the Bureau.

NZ, during the season 1951-52. The following varieties were highly resistant: Calder, New Zealand Sensation, Wilhelmsburger Øtofte, Bangholm Wilby Øtofte, Granhovsdet Hunsballe, Balder and Vilförmorin's White-fleshed Green-top.

2777 ESTRADA RAMOS, N.

Solanum stenotomum Juz. et Buk., una especie importante en el mejoramiento genético de la papa. (*S. stenotomum* Juz. et Buk., an important species in the genetic improvement of the potato).

Agricultura Trop. 1953 : 9 : No. 2 : 31-33.

Reference is made to clones of *S. stenotomum* whose tubers germinate without dormancy. They have been crossed successfully with *S. demissum* and *S. acaule*.

2778 BRÜCHER, H.

Über das natürliche Vorkommen von Hybriden zwischen *Solanum simplicifolium* und *Solanum subtilius* im Aconquija-Gebirge. (The natural occurrence of hybrids between *S. simplicifolium* and *S. subtilius* in the Aconquija mountains).

Z. indukt. Abstamm.- u. VererbLehre 1953 : 85 : 12-19.

Hybrids between the two species produced artificially strongly resembled plants found growing wild in a certain area of the basin of the river Potrero in Argentina, where the areas of distribution of the two species meet. The hybrids all have 24 somatic chromosomes, like the parental species, but are pollen sterile and reproduce themselves vegetatively. They have colonized a number of arid slopes where neither of the parent species seem able to survive successfully, and display considerable morphological variation. Brief reference is made to other natural hybrids observed, one of which was a triploid ($2n = 36$) which has colonized sand dunes, on which none of the parental species have been found. An emphatic warning is given against establishing such forms as independent species and the opinion is expressed that several "species" such as *S. Emmeae*, *S. Horovitzii*, *S. Knappei*, *S. saltense*, and probably also *S. Parodii*, *S. Garciae* and *S. jujuyense* are no more than variants within the collective species *S. subtilius*.

Resistance to Colorado beetle is reported in *S. subtilius* and to virus Y in *S. simplicifolium*.

2779 SCHULZE, E.

Über "Schosser"-Bildung und Modifikationen der Knollenform und Schalenoberfläche bei der zweiten Erstling-Generation. (On the creation of bolters and modifications of the shape of the tuber and of the skin of the second generation of Erstling).

Z. Pflanzenz. 1953 : 32 : 197-200.

Experiments on 60 varieties to reduce the period of dormancy by mechanical treatment were all successful. In each of three successive years two crops of the variety Erstling, planted in the open, were obtained, the period of dormancy being reduced to 4-6 days.

A number of other changes, characteristic of bolters, were noted in the second generation obtained from tubers of the first crop. A bushy growth was produced, with stronger and more upright stems than the first crop. Many fully developed flowers were produced, the period of flowering was prolonged, and there was no premature discarding of blossoms. The tubers were slightly larger, and changed in shape from long oval to round oval. In 90% of cases, the skin of the second generation was rougher and strongly wrinkled.

A report will be made later on the methods employed and their use for breeding purposes.

2780 FEDIN, A. H.

(Results of sowing potatoes from seed for eight years).

Priroda (Nature) 1953 : No. 4 : 101-02. [Russian].

Reproduction of the variety Alma by true seeds led to a marked diminution in yield of tubers and departures from the varietal type.

2781 PATTERSON, C. F.

A method of obtaining fruits in the potato variety Russet Burbank.

Amer. Potato J. 1953 : 30 : 89-91.

Russet Burbank and other varieties which fail to set seed under normal conditions, have been induced to do so by the provision of an 18 hour day and growing temperatures of 50°-60° F.

2782 THOMPSON, N. R. & WHEELER, E. J.
A rapid test for the prediction of color in the cooked potato.

Amer. Potato J. 1953 : 30 : 119-23.

Determination of the colour of the cores of raw tubers, when immersed in 95% ethyl alcohol, provides a rapid method of predicting the colour of the cooked potatoes. The test should be useful in selecting seedlings at the early stages of breeding.

- 2783 DE WILLIGEN, A. H. A. & DE GROOT, P. W.
Quick analysis of small samples of new potato varieties.
 Plant & Soil 1953 : 4 : 377-83.

A description is given of methods developed at the Experiment Station for Potato Processing, Groningen, Netherlands, for determining dry matter content, and the refractive index, conductivity and N content of the juice in selection work.

- 2784 THIJN, G. A.
 De nieuwere Duitse aardappelrassen. **(The newer German varieties of potatoes).**
 Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1953 : 9 : 84-85, 92-93.

Thirty-six German varieties of the early, medium early and late classes are listed with notes on their origin and qualities.

- 2785 Svensk sortlista för potatis (Riktsortlistan). 1952 års upplaga. **[Swedish variety list for potatoes (Guide list of varieties). 1952].**
 Sverig. Potatisodlares Riksförb., Stockholm 1952 : Pp. 23.

The 24 varieties described comprise potatoes for table, fodder and industrial uses. The criteria used in comparing the varieties included: earliness, yield, flavour, dormancy, content and yield of starch, cooking qualities, size and shape of tuber, disease resistance and depth of eyes. Six tables are appended showing the country of origin and date of release to the market of the different varieties, as well as some of the above mentioned characteristics.

- 2786 DAVIDSON, T. M. W. & LAWLEY, D. N.
Experimental evidence of clonal variation affecting yield in potatoes.
 Emp. J. Exp. Agric. 1953 : 21 : 137-40.

Analysis of yield variance in eight clones selected for high or low yield from seed plots of King Edward at East Craigs, Edinburgh, has shown that some clones give much higher yields than others; their yielding capacity was consistent over a period of three years. Since yield differences are apparently heritable, selection of a high yielding strain may be possible. It is considered unlikely that mutations affecting yield occur sufficiently frequently to allow the rapid degeneration of any superior clones.

- 2787 GONČARIK, M. N.
(A comparative physiological evaluation of potato varieties).
 Selekcija i Semenovodstvo (Breeding & Seed Growing) 1953 : No. 1 : 33-37. [Russian].

Maria Hrennikova, obtained by interspecific hybridization at the Igarka Agricultural Research Station, proved the most productive variety in the Enisei Basin. It is more adapted to the Siberian climate than the standard Courier.

- 2788 NENAŠEV, V. V.
(The methods of cultivating the potato in northern Ural).
 Sad i Ogorod (Fruit and Vegetable Gardens) 1953 : No. 5 : 53-54. [Russian].
 The potato variety 1751/1, originating from the Institute of Plant Industry, proved the hardiest and the most productive in recent trials at the Sama State Farm.

- 2789 ESTRADA RAMOS, N.
 La resistencia a las heladas en relación con varias especies de papas. **(Frost resistance in connexion with various species of potato).**
 Agricultura Trop. 1953 : 9 : No. 5 : 17-22.

Data obtained at the Potato Experimental Station in Colombia show resistance in clones of *Solanum acaule*, *S. depexum*, *S. demissum* and, to a slightly lesser degree, in *S. curtilobum*, *S. Juzepczukii*, *S. ajanhuiri* and *S. tuquerrense*. Crosses have been made between *S. curtilobum* and *S. andigenum* (varieties Tocana and Tuquerreña) and between *S. ajanhuiri* and *S. andigenum* (variety Tocana).

- 2790 FAVOROV, A. M.
(The principal questions of growing potatoes in the south).

Sad i Ogorod (Fruit and Vegetable Gardens) 1953 : No. 5 : 49-53. [Russian].
 Kurjer Odesskii Ulučšennij [Improved Odessa Courier] outstripped in yield all other potato varieties tested in the Kirovograd, Kiev and Sumy provinces. It was developed at Odessa by sowing the variety Courier for one generation in summer. Mention is made of promising new varieties, Odessa 357/47 and Odessa 71/47, which are adapted to drought conditions.

- 2791 ELLISON, J. H.
Varietal susceptibility to internal brown spot of potatoes.
 Amer. Potato J. 1953 : 30 : 92-94.

Experiments at the Long Island Vegetable Research Farm have shown that Pontiac,

Kennebec, Katahdin and Mohawk are relatively resistant to internal browning.

- 2792 EMILSSON, B. & GUSTAFSSON, N.
Scab resistance in potato varieties.
 Acta Agric. Scand. 1953 : 3 : 33-53.

Significant differences were noted among Swedish varieties and introductions from other European countries and the USA with regard to the type of scab developed in scab-infected plots on different soils in Sweden from 1946 to 1951. Although the percentage of tuber surface showing symptoms was influenced by location and year, the relative resistance of the 47 varieties was independent of environment. Almost all the varieties classified as resistant developed the superficial type of lesion.

- 2793 OORT, A. J. P. & WIERSEMA, H. T.
 Resistentie tegen *Phytophthora*. Bespreking van de dissertatie van Dr C. Mastenbroek. (**Resistance to *Phytophthora*. A review of Dr C. Mastenbroek's dissertation.**)
 Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1953 : 9 : 77-78.

The substance of this article has appeared in more extended form in English (cf. Abst. 2049).

- 2794 PETERSON, L. C. & MILLS, W. R.
Resistance of some American potato varieties to the late blight of potatoes.
 Amer. Potato J. 1953 : 30 : 65-72.

A survey of the blight resistance possessed by varieties released for commercial production in recent years is presented. Reference is made to the improvements achieved by hybridization involving *Solanum demissum* and by application of the results of investigations on the genetics of immunity from different races of the pathogen (cf. *PBA*, Vol. XXII, Abst. 2038 and Vol. XXIII Abst. 1288). The possible appearance of new races of *Phytophthora infestans* in the field is discussed.

- 2795 MÜLLER, K. O. & HAIGH, J. C.
Nature of "field resistance" of the potato to *Phytophthora infestans* De Bary.

Nature, Lond. 1953 : 171 : 781-83.

Assuming that the spread of sporangia within the plot is homogeneous and that the sporangia increase according to geometrical progression, the infestation of the plot is postulated as proceeding according to the formula $C_{ep} = (c.P_1)^n$, where C_{ep} is degree of infestation, P_1 , "probability of becoming infected per unit area of leaf", c , intensity of fructification per single leaf spot,

and n , number of generations per single leaf spot since initial infection. Inoculation experiments were carried out on different varieties under laboratory conditions to test this working hypothesis. A correlation was obtained between measurements representing P_1 and varietal reactions to blight in the field; the later the blight appeared and the more slowly it increased to epidemic proportions under field conditions, the smaller the measurements of P_1 values in the laboratory. The late incidence of blight on later maturing varieties is ascribed to their having relatively low values for P_1 , rather than to a lowering of the efficiency of immune reactions with increasing age; evidence has in fact been obtained that an aging leaf becomes less susceptible to infection. The factors controlling P_1 have been found to be independent of fungus strain. To obtain the highest possible degree of resistance, the breeder should therefore cross varieties having low P_1 values and suitable maturity with those possessing resistance due to hypersensitivity.

- 2796 HEY, A.
 Zur Biotypenfrage des Kartoffelkrebses. (**The question of biotypes in potato wart.**)
 Mitt. biol. ZentAnst. Berl. 1953 : 75 : 173-75.

Two commercial varieties, Hilla and Mira, and some 98 breeding lines have proved resistant to all wart biotypes so far tested; 30 of these breeding lines are promising as commercial types and are being supplied for growing in areas infested with the new biotypes. *Solanum Aracc-Papa* and all forms of *S. demissum* have proved resistant to both old and new biotypes. A collection of seven differential hosts for identifying the wart races is proposed.

- 2797 **A new Scottish potato variety.**
 Scot. Agric. 1953 : 32 : p. 221.

Chancellor, developed by G. M'Arthur, Old Fargie, Gateside, Fife, was registered in 1952 by the Department of Agriculture for Scotland. It is a first early variety, immune from wart and field-immune from viruses A, B and C.

- 2798 THIRUMALACHAR, M. J. & PUSHKARNATH
Resistance of potato varieties to charcoal rot.
 Amer. Potato J. 1953 : 30 : 73-77.

Following tuber inoculations with *Macrophomina Phaseoli*, the relative reactions of a world collection of varieties maintained at Simla have been assessed at the Central Potato Research Institute, Patna. Mackelvie's seedling 305/50

and two *Solanum andigenum* varieties, CPS 797 and CPS 798, exhibited resistance in the form of necrosis at the point of infection, preventing the penetration of hyphae. Consistent and symptomless immunity was shown only by lines derived from a single interspecific hybrid belonging to the series *Commersoniana*. Selection is in progress among these clonal lines.

2799 ELLENBY, C.

Resistance to the potato root eelworm, *Heterodera rostochiensis* Wollenweber.

Nature, Lond. 1952 : 170 : 1016-17.

Five lines from the Commonwealth Potato Collection, CPC 1673, 1685, 1692, 1595 and 1647 have shown eelworm resistance in repeated tests at the Department of Zoology, University of Durham, England. The first four belong to *Solanum tuberosum* subsp. *andigenum*; CPC 1647 is a sterile triploid. The results of tests on plants from selfed seed of three of these *andigenum* lines at Wageningen, Netherlands, suggest that resistance is heritable (cf. Abst. 2800). The resistance of all four lines is being examined on a much larger scale, in both England and Holland.

2800 TOXOPEUS, H. J. & HUIJSMAN, C. A.
Genotypical background of resistance to *Heterodera rostochiensis* in *Solanum tuberosum*, var. *andigenum*.

Nature, Lond. 1952 : 170 : 1017-18.

In experiments at the Institute of Agricultural Plant Breeding, Wageningen, Netherlands, 25 of the seedlings derived from selfed seed of var. *andigenum* lines 1673, 1685 and 1692 from the Commonwealth Potato Collection, Cambridge, England, exhibited resistance to eelworm infection; seven were susceptible. Resistance is apparently inherited but the progenies were too small for genetical analysis.

2801 SCHAPER, P.

Beitrag zur Resistenz des *Solanum chacoense* (Bitt.) gegen den Kartoffelkäfer (*Leptinotarsa decemlineata* [Say.]). [Contribution on the resistance of *S. chacoense* (Bitt.) to Colorado beetle (*L. decemlineata* [Say.]).

Züchter 1953 : 23 : 115-21.

Feeding on hybrids of *S. chacoense* resulted in partial or complete suppression of egg laying capacity. Even so-called susceptible hybrids, which produced no toxic effect on the larvae

themselves, reduced the fertility of the insects in the next generation; the summer generation of insects were more susceptible than the winter generation.

Similar effects, though in a lesser degree, were exerted by hybrids of *S. Salamanii*, *S. polyadenium* and certain clones of *S. demissum*.

2802 SIEBENGA, J.

Technische vraagstukken. V. Over S-virus. (Technical problems. V. On virus S).

Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1953 : 9 : p. 103.

To avoid possible confusion the so-called "new" virus BB of potatoes is renamed virus S. Current work in Holland is mentioned on the strains of this virus, the symptoms and reaction to it in different potato varieties and its transference from one potato variety to another.

2803 ROSS, H.

Über die Resistenz der Kartoffelsorten gegen das A-Virus auf der Basis Überempfindlichkeit. 1. Mitteilung. (On the resistance of potato varieties to the A virus on the basis of hypersensitivity. First report).

Z. Pflanzenz. 1953 : 32 : 153-66.

Investigations of 75 German and 4 foreign varieties of potato showed that the German varieties Ackersegen, Augusta, Biene, Bona, Erstling, Fortuna, Frühnudel, Frühperle, Hindenburg, Marktreidwitzer Frühe, Mittelfrühe, Primula, Roswitha, Sommerkrone, Stella and Wiga, together with the foreign varieties Abundance, Cardinal and Kerrs Pink, are hypersensitive to virus A. The author gives detailed data on the reaction to infection of each variety tested and compares his findings with those of other investigators.

2804 HEDOU, J., LE HIR, J., LE CORRE, P. & LE LANN, P.

Laboratoire de sérologie de Brehoulou. (Laboratory of serology at Brehoulou).

Pomme d. Terre Franç. 1953 : 16 : No. 167 : 3-8.

Investigations into the effect of viruses X and Y on various varieties of potato showed Ackersegen, Arvor, Bintje, Fin de Siècle, Flava, Hyva, Kerpondy, Krassava, Kotnov, Muntinga 17, Nova, Ostbote, Sieglinde, Solanum and Ultimus to be immune for all practical purposes from both viruses.

- 2805 ROSS, H.
Viruskrankheiten und Virusresistenz-
züchtung. (**Virus diseases and
breeding for virus resistance**).
Kartoffelbau 1953 : 4 : 73-74.

A brief survey is given of the position reached in Germany in breeding potato varieties resistant to leaf roll and viruses X, Y and A, with comments on the way resistance to each virus is inherited and the role played by various South American wild species in building up resistant material.

- 2806 ROSS, H. & KÖHLER, E.
Das Verhalten deutscher Kartoffelsorten gegenüber verschiedenen Stämmen des X-Virus im Pflöpfversuch. II. Mitteilung. (**The reaction of German potato varieties to different strains of virus X in grafting experiments. II.**).
Züchter 1953 : 23 : 72-86.

Experiments were made with a number of further strains (cf. *PBA*, Vol. XXII, Abst. 523) and 42 more German, together with 15 foreign, potato varieties. Fortuna, a hybrid of Ella x *Solanum andigenum*, was the only one of the 95 German varieties which was hypersensitive to all strains.

A study of the reaction of the tuber progenies of the plants grafted in the previous year enabled certain further conclusions to be reached regarding the relationship between the different strains of the virus; in the progenies of the most hypersensitive plants the virus had been completely eliminated. Progenies of hypersensitive plants grown in the field and brought in contact with infected tissue also proved free from infection. Observations on the process of elimination of the virus suggest that this does not occur entirely in the necrotic regions but may take place also in the cytoplasm of neighbouring tissues, without the symptoms of necrosis. Data are presented showing the reaction of the progeny of a number of varieties representing different reaction types. Fortuna gave a progeny consisting of 40 plants showing mosaic, 27 necrotic and 18 with no symptoms. The progenies of susceptible varieties almost all showed mosaic. Partially hypersensitive varieties showed variations in their progeny which indicate that more than 2 genes are concerned in the inheritance of hypersensitivity. No light on the origin of these genes was shed by a study of the parentage of the hypersensitive varieties.

- 2807 KÖHLER, E.
Der *Solanum demissum*-Bastard "A6" als Testpflanze verschiedener Mosaikvir-
en. (**The *Solanum demissum* hybrid "A6" as a test plant for various mosaic viruses**).
Züchter 1953 : 23 : 173-76.

This hybrid, a selection from an F_1 cross between *S. demissum* and Aquila, gave characteristic reactions to all strains of potato viruses A, X and Y, as well as to the rattle virus and the bouquet ring-spot virus of tobacco and the *Aucuba* (F/G) virus of potato.

- 2808 RØNDE KRISTENSEN, H. & CHRISTENSEN, M.
Serologiske undersøgelser af kartoffel virus x. (**Serological investigations of the X virus of the potato**).
Tidsskr. Planteavl 1953 : 56 : 513-31.

Results obtained at the Danish Experimental and Research Station for Plant Diseases and Pests are discussed with special reference to technique. Though the agglutination method was used in nearly all the tests made, the precipitation method is preferable for quantitative tests.

The length of time that infected plant material retains its serological activity and the effect of dilution of sap from infected plants on the agglutination reaction and on infectivity are discussed.

The results of serological tests of 270 tubers from 26 varieties of potatoes are tabulated.

- 2809 JÄHNEL, G.
Ergebnisse der Kartoffelversuche des Jahres 1952. (**Results of investigations into potatoes during the year 1952**).
VersErgebn. Bundesanst. alp. Landw., Admont 1953 : No. 19 : Pp. 17. (Mimeographed).

Investigations were made into the comparative suitability, under Alpine conditions, of different varieties of potatoes.

Oberarnbacher Frühe [Oberarnbach Early] proved highly susceptible to leaf roll, and Falke [Falcon] and Panther suffered badly from blighted tubers.

- 2810 LYNCH, P. B.
Potato variety trials.
N.Z. J. Agric. 1953 : 86 : p. 321.

The performance of some 25 commercial varieties in different parts of New Zealand during the past five years is discussed, with

particular reference to yielding ability, maturity, late blight resistance and tuber quality.

2811 New varieties must be good.

Agric. Res., US Dep. Agric. 1953 : 1 : No. 2 : 11-12.

A popular account is given of the development of the new sweet potato, Sunnyside, released cooperatively by the US Bureau of Plant Industry and Maryland Agricultural Experiment Station. It is a moist type with good canning quality, and is expected to replace Maryland Golden. In carotene content it is superior to Porto Rico. It has the disadvantages of a bland flavour, tan-coloured skin and susceptibility to wilt.

2812 MINABE, M.

(On the inheritance of skin colour and flesh colour in the root tubers of the sweet potato).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : 29-30. (Abst.). [Japanese].

General observations are reported on the inter-relations and biochemical basis of the different types of skin and flesh pigmentation noted in a series of hybridization experiments carried out in Japan.

2813 CHATTERJEE, D. & NAGBISWAS, S. C.
Some observations on the floral biology of sweet potato.
J. Indian Bot. Soc. 1952 (1953) : 31 : 352-57.

Observations on flower opening, anther dehiscence and pollen characters in the variety GR 6 at the Indian Agricultural Research Institute, Delhi, are reported. Although the flowers do not set fruits in Delhi, pollen fertility ranged from 76.5 to 100%. The plants appeared to be self sterile.

2814 High-yielding Redgold, new Oklahoma 'yam.'

Sth. Seedsman 1953 : 16 : No. 5 : p. 75.

Moist golden flesh, an attractive dark red skin and a considerably higher vitamin content than Unit No. 1 characterize the sweet potato Redgold, recently released by the Oklahoma Agricultural Experiment Station. The new variety is tolerant of stem rot and wilt, and shows the same reaction to nematode as Allgold. In trials at Idabel and Bixby, Redgold gave an average yield of 244 bushels of No. 1 roots per acre, while Allgold and Porto Rico yielded 185 and 128 bushels, respectively.

2815 Nematode-resistant sweet potato ready.

Sth. Seedsman 1953 : 16 : No. 6 : p. 36. Okla. 46, a sweet potato of the dry-fleshed Jersey type, has been developed at the Oklahoma Agricultural Experiment Station from a complex cross between numerous strains of the dry-fleshed type. The new variety possesses a high degree of nematode resistance and some tolerance of soil rot.

FIBRES

2816 Annual Report of the Indian Central Jute Committee, Calcutta, for the year 1951-52 : Pp. 45.

Corchorus. New strains of *C. capsularis* and *C. olitorius* considerably outyielded the controls in varietal trials.

Work on the genetics of pigmentation continued. Axillary branching habit of Indian jutes is dominant over the extra-axillary habit of introduced types, and is dependent upon a single factor. Repand leaf is dominant over normal, and monogenically inherited.

Study of vegetative rapprochement as a means of overcoming incompatibility in hybridization between *C. olitorius* and *C. capsularis* continued. The cause of this incompatibility is not to be found in the style lengths.

In *C. trilocularis* and *C. fascicularis*, $n = 7$. Hypoploidy and hyperploidy were observed in these two species, *C. olitorius*, *C. capsularis* and *C. tridens*.

Fertility in colchicine-induced tetraploids is high, in spite of multivalent formation. Crosses were made with diploids to secure triploids.

Irradiated pollen has been used in selfing and crossing in an attempt to produce mutants.

Information useful for breeding has been obtained on intervarietal and interspecific differences in growth characteristics.

Other fibre crops. *Hibiscus cannabinus*, *H. Sabdariffa* and *Abutilon* were selected. Hybrids were made between these two species of *Hibiscus* for studying the pigmentation pattern and characters of the leaf. Flax x linseed hybrids are under observation.

2817 Progress reports from experiment stations, season 1951-52.

Emp. Cott. Gr. Corp. Lond. 1953.

Cotton Research Station, Namulonge.

Progress report for the season 1951-52.

Wickens, G. M. Plant pathology. (pp. 22-26).

Further tests were carried out on the seed, stem

and boll methods of inoculation with *Xanthomonas malvacearum*. Some cottons, e.g. Albar 49, showed no marked resistance to cotyledon infection but were resistant to stem and boll attack; others, e.g. BAR 7/8 (B_2B_3) were resistant to cotyledon infection but susceptible to stem attack. Strains carrying B_2 only had little resistance. After foliage spraying with inoculum, BAR 4/18 [X 1730A B_2B_{6m} (*Gossypium barbadense*)] showed no symptoms (cf. Abst. 1323). Seed inoculation combined with stem inoculation by the needle-prick technique offers the best means of selecting highly resistant plants under local conditions. Progenies of several strains were examined for resistance to stem inoculations of *Verticillium Dahliae*; some provided resistant plants for further testing.

Hutchinson, J. B., MacDonald, D. & Manning, H. L. *Plant breeding*. (pp. 27-32).

Albar 51 lines and hybrids of Albar 49 x BP 52 backcrossed to commercial East African varieties were selected for resistance to bacterial blight. Strains of MU 8 x BP 52² and MU 8 x Tidewater compared favourably with the controls in yield. The MU 8 x BP 52² material is superior to BP 52 in jassid resistance, earliness, size of boll and ginning outturn; the best lines equal BP 52 in quality. Selections of both crosses are however susceptible to *Verticillium* wilt and bacterial blight. Crosses have been made with the blight-resistant Stoneville 20. Selection of BP 52 progenies by the model bulk technique is giving good results (cf. PBA, Vol. XXI, Abst. 2822).

Peat, J. E., Munro, J. M. & Arnold, M. H. *Tanganyika Territory. Lake Province. Progress report for the season 1951-52*. (pp. 1-14).

Uk 48 and Uk 51 (cf. PBA, Vol. XXII, Abst. 2836) have outyielded Uk 46 in extensive trials. In breeding for resistance to bacterial blight, using Albar 51 as the source of resistance, the first generation has been secured. Breeding for increased leaf hairiness and thus improved jassid resistance has been initiated.

Hastie, M. S. *Kenya. Nyanza Province. Progress report for the season 1951-52*. (pp. 1-5).

Varieties and strains are under observation.

Anglo-Egyptian Sudan. *Progress report of the cotton breeding stations, season 1951-52*.

Knight, R. L. & Rose, M. F. *Introductory note*. (pp. 1-2).

A fundamental change has been produced in the

system of filtering of progeny rows (cf. PBA, Vol. XXI, Abst. 2822). Since improvement in agricultural characters such as yield, quality and ginning outturn is essentially a process of building up complexes of minor genes, whether or not these are superimposed upon a major gene, the value of selection in continuously self-bred material is restricted. At the Medani and Kadugli stations strains will therefore be filtered only in alternate seasons. Filtered strains will be grown in isolation, preferably for not less than two generations, to produce higher levels of minor genes by random mating and subsequent segregation.

Rose, M. F. & Hughes, L. C. *Gezira Station*. (pp. 3-9).

BAR lines of Egyptian cotton were selected. Work on the production of salt-tolerant BAR cottons has been initiated, and an attempt made to find the best technique for testing seedlings. The possibility of transferring the stormproof character or lint retention of *G. contextum* to Sakel is being explored.

Knight, R. L., Dowdes, H., Cuany, R. L. & Sadd, J. *Shambat Station*. (pp. 9-13).

Production of Domains Sakel derivatives resistant to both blackarm and leaf curl continued. Transference of B_{6m} to B_2B_3 Sakel is in progress. Transferences of B_5 , B_7 and the *G. herbaceum* gene for blackarm resistance to Sakel and of B_5 to X 1730 are at advanced back-cross stages. In breeding blackarm resistant strains of American Upland, transference of B_{6m} to B_2 or B_2B_3 stocks has been undertaken (cf. Abst. 1323).

Breeding for jassid resistance on the basis of hairiness continued. In the transference of the hairiness of MU 86 (Malwa Upland type from India) to Sakel, the full hairiness of this cotton was recovered in the F_2 of the fourth back-cross; homozygous H_1 and leaf-curl resistant H_1B_2 stocks have been used for back-crossing; the fourth back-cross F_2 selections have been crossed with a leaf-curl resistant Sakel type homozygous for B_2 , B_3 and H_1 . The hair-length modifiers of Ferguson have been recovered from the sixth back-cross F_2 , the last three back crosses being made to blackarm-resistant H_1 Sakel. In straight hybridization, the full hairiness of Ferguson was recovered in the fourth back-cross F_2 , but Ferguson *H* was still completely linked with one of the duplicate genes for chlorophyll deficiency and was in a heterozygous condition. The factor for hairiness in the Upland cotton Pubescent T 611 proved to be identical with H_2 from *G. tomentosum*.

Transference of increased number of locules from 4n *G. sanguineum*, 4n *G. herbaceum*, Philippines Ferguson and Stoneville 20 to blackarm and leaf-curl resistant Sakel continued. The cross *G. barbadense* [BLR 14/25 (B_2B_3)] x *G. anomalum* was treated with colchicine, giving hexaploid *G. anomadense*, which was successfully back-crossed to BLR 14/25. This work aims at transferring genes for lint quality and small bract from *G. anomalum*.

In breeding for earliness, promising progenies were selected from 4n *G. herbaceum* (Wagad 8) back-crossed to black-arm and leaf curl resistant Sakel.

Douwes, H. & Cuany, R. L. Cytogenetics. (pp. 13-15).

Hybrids between *G. Sturtii* and *G. hirsutum* have been secured and are to be treated with colchicine. The hybrid *G. thurboreum* x *G. arbanomalum*, with the genomic constitution ADAB, yielded a few seeds on back-crossing to *G. arbanomalum* (cf. Abst. 2836). Study of the relationships between wild species continued. *G. Robinsonii* carries the C genome. The genetics of the blackarm resistance of West African and West Indian types of *G. punctatum* is being analysed. Samaru 26C and a weakly resistant component of Nigerian Allen contain only one major gene, B_2 . Transference of single gene characters to leaf-curl resistant and blackarm susceptible *G. barbadense* for linkage studies of the *B* genes continued. B_2 was found to segregate independently of the following characters: nonexpansive lint (nx), Guatemala khaki lint (Lc_1^K), Gambia brown lint, virescent yellow (v), hairiness (H_1), red leaf (R_2^{LW}), crinkled (cr), super-okra (L^s), okra (L^o), round leaf, short branch (Sh), red filaments, petal spot (R_1), cream corolla (Y_1^p), cream pollen (p) and naked seed (ft).

Barlow, K. C. Kudugli Station. (pp. 15-20).

Progenies of the Upland cotton BAR NT 96/40 (B_2) were selected for general improvement in habit, seed cotton and yield.

Ducker, H. C. Nyasaland. Cotton Experiment Station. Progress report for the season 1951-52. (pp. 1-7).

Plants apparently immune from bacterial blight have been obtained from Albar 49 x CL 20 and Albar 49 x BP 52 x CL 20. MU 8 x BP 52 hybrids are susceptible to bacterial blight, but since their other characters are good they may prove useful in future crosses.

James, R. W. Southern Rhodesia. Cotton Research Station, Gatooma. Progress report for the season 1951-52. (pp. 1-7).

In the scheme to transfer blackarm resistance to strains with good quality, MU 8A x BP 52² selections were crossed with resistant Albar.

King, H. E. Northern Nigeria. Progress report for the season 1951-52. (pp. 1-25).

BAR D28, BAR 17/1 (Allen derivative) and substrains of 26C were selected. Repeated reselection of MU 8A has resulted in a small improvement in lint length.

Anson, R. R. Aden Protectorate. The Abyan Scheme and Cotton Experiment Station. Progress report for the season 1951-52. (pp. 1-5).

A cotton experiment station was established in 1951. Pure seed of introduced cottons has been produced prior to varietal tests next season.

Lochrie, J. V. & Spence, J. R. West Indies. Cotton experiment stations. Progress report for the season 1951-52. (pp. 1-17).

As in previous years, VH 8 progenies did not differ significantly in yield from the control V 135 at Camden Park, St. Vincent. Selection of MSI continued at the Montserrat Station. In Antigua, yield and spinning tests of VH 8, VH 10 and BD selections continued, to find a cotton suitable as a substitute for MSI, which has low quality in this island and Nevis.

Peters, R. W. Queensland. Regional Experiment Station, Biloela. Progress report for the season 1951-52. (pp. 1-11).

Selection of jassid-resistant back-cross strains of Miller continued.

2818 Thirtieth Annual Report of the Indian Central Cotton Committee for the year ended 31st August, 1951 : Pp. 83.

Technology

Research undertaken at the Committee's Technological Laboratory to determine the spinning qualities of new strains developed by breeders is reviewed (cf. Abst. 2833).

Genetics

Investigations reported from the Institute of Plant Industry, Indore, include a study of linkage between genes for lintlessness, especially in two new hairy lintless mutants. A chlorophyll deficient mutant derived from a naturally occurring chimera, a virescent mutant in Tella-pathi and a light green form of Jarila are all due

to simple recessives the gene for normal chlorophyll development being dominant. Analyses of progenies of Buri 107 and a Bazar strain of Upland breeding true for different grades of green and white fuzz have shown that the green-fuzzed lines have a higher ginning percentage than those with white fuzz. At Surat, interspecific hybridization between Asiatic and American varieties has given rise to high yielding offspring with staple length exceeding 1 in. One of these, 125-Co. 2-B 18, was also resistant to blackarm and red leaf blight at Dharwar and Karnatak. Preliminary attempts to exploit hybrid vigour are reported.

Statistics

Data concerning plot size and shape for progeny row trials at Indore indicate that incomplete block designs give greater efficiency than randomized blocks only when plots are larger than 50 sq. ft. Double, treble and balanced lattices are equally reliable designs for incomplete blocks. Statistical analysis of the F_{10} of *Gossypium arboreum* crosses revealed a slight decrease in mean halo length of lines selected for low values, contrary to the tendency towards increasing length noted in recent years (cf. Abst. 1310). Breeding for crop improvement is surveyed in each state in turn.

Bombay

Secondary selections of strain 197-3 (Jarila x *G. neglectum* var. *roseum*) have shown promising yielding ability in Khandesh. F_1 hybrids from crosses between 197-3 and long-staple strains of *G. arboreum* from Madras have been selected for further study.

In the Surat tract, three wilt-resistant selections, 2087, 2266 and 3652, have yielded as well as the standard Suyog; 2087 has a longer staple and better spinning quality than the latter. A few F_3 individuals from 3652 x 1027 ALF combine superior staple quality and a high degree of wilt resistance (cf. *PBA*, Vol. XXII, Abst. 1270).

Hybridization to develop *Fusarium* resistant cotton with better yield, ginning percentage and spinning quality than Vijay continued at Broach. Six promising lines were selected.

In the scheme for improving yield, staple length and earliness of Kalyan for the Wagad tract, ten new crosses were made with strains of *G. herbaceum* from Dharwar or Broach. None of the newly developed Dharwar-American hybrids has excelled Laxmi in respect of yield or earliness. At Amreli, promising selections were obtained from Pratap crossed and back-crossed with strains of *G. arboreum* from Coimbatore.

Punjab

Some 70 selections with staple longer than 1 in. were made from crosses between Punjab-American strains; the ginning outturn and yield of some of these selections were also satisfactory. Hybrids with halo length exceeding 28 mm. were obtained from Punjab-American strains x Madras varieties with long lint; other crosses involving Giza and Ashmouni strains from Egypt and B 4/15 from the Sudan produced a staple length of 32.8 mm.

Punjab-American strains developed for the submontane district of East Punjab have outyielded short-stapled desi varieties in recent trials. On the basis of consistent performance, the high-yielding selection 320 F has been introduced for general cultivation in the area.

Madras

Four superior hybrid selections were obtained from advanced generations bred at Adoni to replace 881 F and local Mungari.

The fibre properties of several Cocanadas hybrids between 336 B and Manipur Khaki proved outstanding and the valued pinkish lint colour was maintained.

Progress was made in breeding hardy Cambodia strains for rainfed districts. Several F_1 and F_2 hybrids from *G. hirsutum* crosses combine hardiness with significantly better yield, lint length and ginning outturn than control varieties; strain 689-18-4/4 was particularly adaptable.

Breeding to increase the yielding ability and ginning outturn of early maturing Westerns with wilt resistance has continued. At Hagari, four hybrid families, 4272, 4327, 4331 and 4333, proved superior to H 1, with respect to yield and ginning outturn.

A white Northern selection designated 6234 (N 14 x 1523) significantly outyielded N 14; its ginning outturn was 35% and its staple properties were comparable with those of N 14. Three other hybrids, 6186, 6199 and 7057, also yielded better than N 14.

Preliminary trials of Tinneveli and Karunganni cottons are reported in the programme for improvement of ginning outturn and fineness of fibre; several strains were selected for further study.

Two American hybrids, 9995 and 0734, showed particular adaptability to winter conditions in central districts. Six other adaptable selections from crosses between strains with superior staple length combined good yield, long staple and high ginning outturn.

Madhya Pradesh

A few selections from a large number of progenies and strains of desi and American cottons have yielded well in the Nagpur-Wardha tract and the Akola and Amraoti districts. Selection to obtain improved lines of Jarila for the Buldana tract, and hybridization to develop desi strains better than V 434 for the Ghat region have shown progress.

Assam

Breeding of hill cotton aims at the production of a high-yielding type with short coarse staple and a high ginning percentage. Garo 54-1 and D 46-2-1 outyielded other progenies of single plant selections and locally cultivated varieties. All offspring from Garo hill cotton had very coarse staple and a ginning outturn of 47.5%.

Hyderabad

Five improved strains of Gaorani have been selected for the heavy black soils of Parbhani. All five mature earlier than local Gaorani and three, namely II-44-1244, II-45-2204 and II-45-2513, significantly outyielded both Gaorani 12 and the local variety. Nine selections proved homozygous for wilt resistance and had a higher ginning outturn than their parents.

Mysore

The programme of crossing local strains with American varieties to increase staple length has been continued. Seven promising hybrids were obtained from Mysore-American 5 crossed with Tide Water and Express. Work is in progress on the acclimatization and breeding of Egyptian and Sea Island cottons for local conditions.

Rajasthan

The object of local breeding is to develop strains of desi and American cottons with longer staple than Indore 1. Two new strains, M 48-4 and M 48-46, gave a higher ginning outturn than the latter; several more selections have desirable yield and quality.

Madhya Bharat

Many high-yielding desi hybrids have been selected from crosses involving Malvi 9, Jarila, Bhoj and Verum varieties. In trials at Indore, Malvi 12 failed to repeat its good performance of previous years, but Malvi 10 continued to excel Malvi 9 in respect of ginning outturn, spinning performance and resistance to wilt. Hybridization to combine the yield of Nimari with the fibre properties and wilt resistance of Jarila has resulted in the production of an outstanding selection, D 46-5.

2819 WAKANKAR, S. M.

Some potentialities of tree cottons in India.

Sci. & Cult. 1953 : 18 : 419-20.

The results of preliminary trials suggest that cultivation of tree cottons (*Gossypium arboreum*) may be worthwhile. It is briefly suggested that improved types could be developed by the exploitation of hybrid vigour, and selection or hybridization to produce disease and pest resistant varieties, followed by crossing with long-staple annual cottons.

2820 JAGANNATHA RAO, C., MARAR, K. S. & SANTHANAM, V.

A brief review of the cotton breeding problems in the Madras State with special reference to improvements in yield and quality.

Indian Cott. Gr. Rev. 1953 : 7 : 48-56.

Research in progress at the Cotton Breeding Station, Coimbatore, is reviewed (cf. Abst. 983 and 2818).

2821 BROWN, C. H.

Cotton in Egypt.

New Biol. 1953 : No. 14 : 44-63.

This general review includes a survey of breeding, referring to the maintenance of genetic variability within stocks to facilitate the selection of types showing new combinations of desirable characters, and to hybridization and back-crossing to incorporate in the hybrids specific factors determining fibre quality and resistance to pests and diseases.

2822 **The Empire Cotton Growing Corporation in Africa. I. The Anglo-Egyptian Sudan.**

Emp. Cott. Gr. Rev. 1953 : 30 : 104-09.

A survey is given of breeding carried out in recent years at Shambat to combine such characters as hairiness, intrinsic fibre strength, and resistance to leaf curl and blackarm in commercially desirable strains (cf. *PBA*, Vol. XXII, Abst. 2836). Details are also provided concerning selection and selfing of promising material sent to Wad Medani and Kadugli after back-crossing at Shambat. Work at Wad Medani, which is reported by M. F. Rose and L. C. Hughes, also involves selection of lines tolerant of saline conditions, and interspecific hybridization to improve the storm resistance of Egyptian cottons.

2823 KNIGHT, R. L. & SADD, J.

The genetics of jassid resistance in cotton. II. Pubescent T 611.

J. Genet. 1953 : 51 : 582-85.

The gene controlling hairiness in the Upland

variety Pubescent T 611 has been transferred by back-crossing to strain BLR 14/16 of Sudan Sakel (*Gossypium barbadense*), and found to be identical with H_2 occurring in *G. tomentosum*. H_2 is essentially a gene for hair density; in the genotypic background of Upland cotton it has the expression of a factor for a high degree of hairiness, since this species carries intensifiers of length. Preliminary data suggest that linkage rather than pleiotropy is responsible for the observed association between a reduction in lint length and the presence of H_2 . The gene H_2 is also associated with reduced plant height.

2824 ABDUL HAMID KHAN

Variations in the genetic segregation in two characters of the cotton plant.

Pakist. J. Sci. 1952 : 4 : 83-94.

In experiments at the Cotton Research Laboratory, Lyallpur, an analysis was made of the possible effects upon simple Mendelian segregation ratios of the date of selfing of the F_1 . The characters used were green *vs.* red plant colour in two *Gossypium arboreum* crosses, and cream *vs.* yellow pollen in three *G. hirsutum* hybrids. Dominants tended to be in excess of the expected numbers when pollination was effected at the beginning and end of the flowering season, but in most cases the deviations were not significant.

2825 KOMATSU, J.

(On parental plants and hybrid combinations in cotton).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : p. 28. (Abst.). [Japanese].

In this review of Japanese cotton hybridization work, special attention is devoted to varieties that have been produced by crossing varieties from the B and D agronomic types, respectively, and from crosses of the C and M groups.

2826 PAYNE, T. L.

Is cotton outdated ?

What's New Crops Soils 1953 : 5 : No. 7 : p. 22.

The progress of cotton breeding in the USA is briefly reviewed, with special reference to the recent incorporation of desirable characteristics of Asiatic and Old World varieties and of wild American species in cultivated American cottons.

2827 Coker's reports progress with new cotton strains.

Sth. Seedsman 1953 : 16 : No. 6 : p. 57.

On the basis of results of trials conducted at seven centres in the Mississippi delta during 1952, strains with good combinations of yielding ability, ginning outturn, staple length and other spinning properties, resistance to *Fusarium* and

tolerance of *Verticillium* wilt have been selected by Coker's Pedigreed Seed Co., Hartsville, SC.

2828 DOUWES, H.

The cytological relationships of *Gossypium areysianum* Defflers.

J. Genet. 1953 : 51 : 611-24.

The hybrid *G. somalense* x *G. areysianum* showed a very high degree of homology between the two parental chromosome sets. A high but slightly lower degree of homology was also found between the two sets of *G. Stocksii* x *G. areysianum*. Very little homology, however, existed between the sets of *G. anomalum* and *G. areysianum*. The chromosome sets of *G. anomalum* and *G. triphyllum* were highly homologous; it may therefore be inferred that chromosome pairing in *G. triphyllum* x *G. areysianum* would have a low frequency. The symbol E_3 is therefore assigned to *G. areysianum*, associating it with its nearest relatives, *G. Stocksii* (E_1) and *G. somalense* (E_2). Classification of the three latter species in sect. *Stocksiana* is supported by their morphological characters, cytological affinities and geographical distribution. Sect. *Anomala* should now consist of *G. anomalum* and *G. triphyllum* only. The present centre of distribution of sect. *Stocksiana* is the region round the Gulf of Aden, whereas that of sect. *Anomala* is southwest Africa. Assuming that the present centres of distribution are the centres of origin, *G. somalense* must have spread from the east and *G. anomalum* from the southwest, thus accounting for the overlapping of the two species south of the Sahara.

2829 BALASUBRAMANIAN, R. & KESAVA IYENGAR, N.

Effect of environment on genotypes in cotton.

Indian Cott. Gr. Rev. 1953 : 7 : 31-37.

Differences in lint length, time of fibre maturity and ginning outturn noted for each of five Upland varieties grown at seven stations in Madras emphasize the need for testing hybrid progenies in numerous tracts, so that seedlings best suited to particular conditions may be selected. It is considered that distribution from a hybridization centre would be effective in the third or fourth generation, when preliminary trials have been completed.

2830 SIRAJ-UD-DIN SHAH

Inheritance of leafshape in American cotton and its relationship with the economic characters.

Pakist. J. Sci. 1951 : 3 : 68-72.

In a cross between *Gossypium hirsutum* varieties, broad-lobed leaves behaved as a simple dominant

character in relation to laciniated. Broad-leaved plants showed higher yields and ginning outturn than the laciniated type; the latter was however associated with longer staple length.

2831 BALASUBRAMANIAN, R.

Leaf shape expression in New World cotton hybrids between wild diploids and cultivated tetraploids.

Curr. Sci. 1952 : 21 : 136-37.

In triploids from crosses of *G. hirsutum* and *G. barbadense* with *G. Raimondii*, the leaves of the fruiting branches were almost entirely similar to those of *G. Raimondii*, lobed leaves of the tetraploid parent being situated on the main stem nodes subtending the branches. In colchicine-induced hexaploids derived from the triploids, the lobed type occurred only at the nodes of the secondary fruiting branches. The pattern of occurrence of lobed leaves is viewed in terms of a timing action resulting from the threshold effects of the dominant wild gene in *G. Raimondii*.

2832 DEO, K. G.

A device for quick determination of ginning percentage.

Indian Cott. Gr. Rev. 1953 : 7 : 38-47.

A simple balance is described for estimating the ginning percentage in a single operation, by determining the ratio between lint and seed in a small sample. This technique facilitates the evaluation of numerous progenies in a short time.

2833 **Annual Report of the Director of the Technological Laboratory, Indian Central Cotton Committee for the year ending 31st May 1952 : Pp. 41.**

Most of the spinning and fibre tests reported were carried out on new strains and improved varieties to be used as standards for future selection. The new technique devised for estimating the spinning quality of very small samples enables new strains to be tested at a very early stage of propagation (cf. Abst. 1321). Progress is reported in technological investigations concerning yarn properties and fibre strength. In connexion with the latter, an apparatus has been designed to determine the strength of attachment of fibres to the seed. The number of fragments of the seed coat pulled out with the fibres increased in the following order of species: *Gossypium herbaceum*, *G. hirsutum* and *G. arboreum*.

2834 KNIGHT, R. L.

The genetics of blackarm resistance.

X. The gene B_7 from Stoneville 20.

J. Genet. 1953 : 51 : 515-19.

The blackarm resistance of the Upland variety Stoneville 20 is due to a major dominant gene,

B_7 , accompanied by a number of minor genes for resistance. When transferred by backcrossing to the genotypic background of Sudan Sakel (*Gossypium barbadense*), B_7 is weaker in expression than B_2 , derived from Upland.

2835 WICKENS, G. M.

Bacterial blight of cotton. A survey of present knowledge, with particular reference to possibilities of control of the disease in African rain-grown cotton.

Emp. Cott. Gr. Rev. 1953 : 30 : 81-103.

The possibilities of controlling bacterial blight in the British Commonwealth Territories in Africa are discussed in the light of the genetical basis of resistance. Although the severity of leaf lesions induced in the field by spraying with a bacterial suspension is used as the criterion of blight susceptibility in the Sudan and the USA, this method of selection has been less practicable in other countries. It is considered that varietal evaluation might be more successful if undertaken at several growth stages. An appendix describes large-scale inoculation techniques, involving the seed, stem and boll, adopted at Namulonge, Uganda. The anomalous behaviour of resistant strains introduced from the Sudan and the USA (cf. *PBA*, Vol. XXII, Abst. 2836) has led to the suggestion that variations in environment may alter the expression of gene complexes; there is also a possibility that different physiological races of bacteria occur in each locality. Breeding for resistance is therefore a separate problem for every region.

2836 **Tests fail to find wilt-resistant cotton.**

Sth. Seedsman 1953 : 16 : No. 4 : p. 53.

None of the 500 varieties imported from the main cotton growing areas of the world showed resistance to *Verticillium* wilt at the Arkansas Agricultural Experiment Station. It was, however, noted that certain varieties gave satisfactory yields despite the wilt.

2837 LAL, K. B. & SINGH, C.

The cotton leaf roller, *Sylepta derogata* Fabr. I. Relative incidence on *hirsutum* cottons. II. Control.

Indian Cott. Gr. Rev. 1953 : 7 : 77-91.

None of the five varieties of *Gossypium hirsutum* grown at six centres in the Uttar Pradesh from 1946 to 1950 showed leaf roller resistance equal to that of desi cottons. The highest degree of resistance among the five American varieties was shown by 100F.

2838 MASIMA, I.

The number of chromosomes and the nucleolar chromosomes in *Linum usitatissimum* L. and some allied species.

Idengaku Zasshi/Jap. J. Genet. 1947 : Suppl. 1 : 122-31.

Chromosome counts from root tips and pollen mother cells of *L. usitatissimum*, *L. angustifolium*, *L. crepitans*, *L. americanum*, *L. africanum*, *L. monadelphum* and *L. nervosum* have shown that all seven species have 30 somatic chromosomes. The bipartite nature of the pair of nucleolar chromosomes, each consisting of two unequal lengths connected by a thin and sometimes achromatic thread, is thought to account for the claims that these species have $2n = 32$ (cf. *PBA*, Vol. VIII, Abst. 1590, Vol. IX, Abst. 1118 and Vol. XII, Abst. 985). In *L. grandiflorum* the chromosome complement was found to be $2n = 16$.

2839 FREDERIKSEN, P. S.

Undersøgelser over en række spind- og olieørtsorters modstandsdygtighed mod hørrust (*Melampsora Lini* (Pers.) Lev.).

[Investigations on the resistance of a series of fibre flax and linseed varieties to *M. Lini* (Pers.) Lev.].

Tidsskr. Planteavl 1953 : 56 : 246-71.

Infection trials in Denmark on 31 flaxes and 20 linseeds are recorded, with a preliminary account of the biology of *M. Lini*.

The fibre flaxes Verum, Cascade and Textilshchik [Tekstilščik] proved immune and some of the linseeds, including Dæhnfeldt Élite and Trifolium, commonly grown in Denmark, were not attacked by *M. Lini* from infected fibre flax straw from Denmark, Sweden and the Netherlands.

2840 LYNCH, P. B.

Linen flax trials in New Zealand.

N.Z. J. Agric. 1953 : 86 : 241-50.

In trials carried out with Liral Crown as standard in different regions since the 1939-40 season, three Russian introductions, designated R1, R2 and R3, have shown promise in respect of agronomic characters and rust resistance.

2841 ŽIDKO, E. P.

(Vegetative rapprochement between hop and hemp).

Agrobiologija (Agrobiology) 1952 : No. 6 : 115-19. [Russian].

Hop grafted on hemp or hemp on hop produced well formed seed at the Žitomir Hop Breeding Station. One-year old slips of hop grafted on

hemp developed well when back-grafted to hemp stocks. The determinate or climbing habit of the grafted material was associated with the complete or partial removal of the foliage from the stock or scion. The grafts of hemp on hop produced seed showing great variability in respect of size. Material grown from the seed resembled the initial hemp plants. Some of these plants were again grafted on hop and pollinated with hop pollen. They produced hemp seed differing from the original seed only by their elongated shape and darker colour with or without traces of mottling. Hemp grafted on hop for several years in succession bore more resemblance to hop than to hemp. Its acquired characters included a branching habit, symmetrical laterals, and small seed without the usual taste of hemp seed.

2842 RAO, N. S. & DATTA, R. M.

Chromosomes of the genus *Corchorus*.

Nature, Lond. 1953 : 171 : p. 754.

In investigations at the Jute Agricultural Research Institute, Barrackpore, West Bengal, *C. trilocularis* ($2n = 14$) has exhibited normal pairing at meiosis. *C. siliquosus* is a natural polyploid ($2n = 28$), with infrequent multivalent formation. Observations on *C. fascicularis* ($2n = 14$) suggest that this species is a structural hybrid. A particularly interesting feature of this species is the occurrence of pollen mother cells with 14 bivalents along with those containing the normal seven. Hyperploid and hypoploid pollen mother cells resulting from irregularities in premeiotic divisions also appear to be characteristic of *C. fascicularis* and several other species.

2843 MCCANN, L. P.

Kenaf (*Hibiscus cannabinus* L.). A bibliographical survey.

Bibliogr. Bull. US Dep. Agric. 1952 : No. 17 : Pp. 20.

The author lists and reviews literature of possible value to breeders and others concerned with the economic production of kenaf.

2844 KUWADA, H.

(On the crossability of different combinations of varieties in the hybrid *Abelmoschus esculentus* x *A. Manihot*).

Kagawa Kenritsu Nogyoosemmongaku Ko Kenkyu Hokoku/Tech. Bull. Kagawa Prefecture Agric. Coll. 1950 : 1 : No. 3 : 30-35. [Japanese].

The combination *A. Manihot* ♀ x *A. esculentus* ♂ is sterile. The reciprocal cross varied in

fertility from 27 to 92% according to the variety of the mother plant. Seed weight of the F_1 was affected by both parents, being greater when the common variety of *A. Manihot* was used as pollinator than when the tall variety was employed.

2845 KUWADA, H.

(On differences in physiological and ecological characters between amphidiploids obtained by breeding and the parent plants. II. On the effect of various chemicals on the germination of the seed).

Kagawa Kenritsu Nogyosemmongaku Ko Kenkyu Hokoku/Tech. Bull. Kagawa Prefecture Agric. Coll. 1949 : 1 : No. 2 : 1-11. [Japanese].

The amphidiploid hybrid between *Abelmoschus esculentus* and *A. Manihot* has a germination capacity on moist filter paper resembling that of the parent species. Its energy of germination, however, is lower. When H_2SO_4 , NaOH, $MgSO_4$ or ether were added, germination was checked to various degrees in both the amphidiploid and the parent species. The reaction of the amphidiploid to various concentrations of these substances more closely resembled that of *A. esculentus* than *A. Manihot*.

2846 KUWADA, H.

(On differences in physiological and ecological characters between amphidiploids obtained by breeding and the parent plants. III. On the effect of soil dryness on growth).

Kagawa Kenritsu Nogyosemmongaku Ko Kenkyu Hokoku/Tech. Bull. Kagawa Prefecture Agric. Coll. 1950 : 1 : No. 3 : 18-29. [Japanese].

On dry soil the amphidiploid hybrid between *Abelmoschus esculentus* and *A. Manihot* grows at a similar rate to *A. esculentus* and is surpassed by *A. Manihot*.

2847 KUWADA, H.

(On differences in physiological and ecological characters between amphidiploids obtained by breeding and the parent plants. VI. On growth on abnormal soils).

Kagawa Kenritsu Nogyosemmongaku Ko Kenkyu Hokoku/Tech. Bull. Kagawa Prefecture Agric. Coll. 1950 : 2 : 13-17. [Japanese].

The amphidiploid hybrid between *Abelmoschus esculentus* and *A. Manihot* grows more vigorously on dry, acid soils than either of the parent

species. Its germination percentage under these conditions is intermediate.

2848 KUWADA, H.

(An experiment on the yield of the amphidiploid of *Abelmoschus esculentus* x *A. Manihot*).

Kagawa Kenritsu Nogyosemmongaku Ko Kenkyu Hokoku/Tech. Bull. Kagawa Prefecture Agric. Coll. 1949 : 1 : No. 2 : 12-16.

Data are provided on the total yield and fibre percentage of the amphidiploid of *A. esculentus* x *A. Manihot*, which has been recently introduced as a fibre plant; it has been tested under various cultural conditions in Kyoto, Japan.

2849 BOYCE, S. W., ET. AL.

Investigations into yellow-leaf disease of *Phormium*. V. Transmission experiments and discussion of control.

N.Z. J. Sci. Tech. 1953 : Suppl. 1 : 34 : 41-46.

Transmission of yellow leaf was achieved in several lines. The absence of symptoms in the field suggests that cultivars SS and Tihore are either symptomless carriers or possess resistance. Should both prove resistant, production of stocks will be an effective control.

2850 BOYCE, W. R. & NEWHOOK, F. J.

Investigations into yellow-leaf disease of *Phormium*. I. History and symptomatology.

N.Z. J. Sci. Tech. 1953 : Suppl. 1 : 34 : 1-11.

A general account of this sap-transmissible virus disease of *Phormium tenax* and *Ph. Colensoi* in New Zealand refers to the cultivar SS, which has shown a high degree of resistance to the virus for 14 years under a wide range of field conditions in the Moutoa area. Resistance was inherited as a recessive character. Some indication of resistance was also found in the cultivars 311 and Tihore.

2851 WEBBER, J. M.

Yuccas of the southwest.

Agric. Monogr. US Dep. Agric. 1953 : No. 17 : Pp. 97.

The results of taxonomic and other botanical studies of the yuccas in the southwestern United States are presented. The survey was undertaken with a view to exploring the potentialities of the plants as a source of cordage fibre.

SUGAR AND STARCH PLANTS

2852 **Annual Report of the Sugarcane Breeding Institute, Coimbatore for 1951-52**: Pp. 129.

An adverse season inhibited flowering in many varieties, but some bulk and semibulk crosses were possible. New crosses involving Co. 281, Co. 356 and two American introductions, CP 29/103 and CP 36/13, were made to improve red rot resistance. Other new crosses involved the vigorous canes Co. 285, Co. 312, Co. 453, Co. 617 and Co. 649, and the early varieties Co. 508, Co. 527 and Co. 867. Co. 527 also proved a valuable parent for transmitting smut resistance and high sucrose content. Promising selections are listed.

Chromosome numbers of numerous interspecific and intergeneric hybrids were determined with a view to discovering whether reduced or unreduced gametes take part in fertilization, assuming that the relationship between *Saccharum* spp. and allied genera is relatively distant when unreduced gametes function. This criterion concerning interrelationship was not, however, supported by the data, which showed that both haploid and diploid gametes may function in some crosses and their reciprocals; both reduced and unreduced eggs entered into the formation of intraspecific *S. spontaneum* hybrids involving the variety Z.W. Cheribon. An egg with an unexpected complement of 68 chromosomes, instead of 40 or 80, functioned in the cross between the Lakhapur variety of *S. officinarum* ($2n = 80$) and *Sclerostachya* ($2n = 30$).

Among the variants of *S. spontaneum* recently collected in the Sino-Himalayan areas of Assam, the Naga Hills and Manipur, some giant forms and types with soft and sweet stems were of special interest. SES 205-A, previously collected from West Bengal, has juice with 14% sucrose. Other recent acquisitions have shown a useful degree of resistance to red rot, smut, drought and salinity. Analyses of stem epidermal patterns and starch content of mature internodes indicate some correlation between these characters and the geographical distribution of different forms.

Information concerning effect of long and short photoperiods and leaf removal on the time of flowering, the chemical composition of the juice of commercial canes, varieties recommended for different parts of India and the parentage of new and standard Co. canes is also included. Results of trials undertaken at the Karnal Substation are reported.

2853 **Annual Report of the Sugarcane Breeding Institute, Coimbatore for 1950-51 (1953)**: Pp. 57.

This is a detailed version of the report summarized already in *PBA*, Abst. 1342.

2854 **Annual Report of the Indian Central Sugarcane Committee for the year 1951-52 (1953)**: Pp. 135.

A survey is given of research in progress at the Sugarcane Breeding Institute, Coimbatore, with particular reference to hybridization, cytogenetical studies and evaluation of the collection of *Saccharum spontaneum* from northern India (cf. Abst. 2852). Varietal trials are reported from many states.

2855 PEARSON, C. H. O.

Cane growing in Natal. Field methods and practices.

S. Afr. Sug. J. 1953 : 37 : 289-99.

A general account of sugar cane cultivation in Natal, and information on varieties recently released, are given.

N : Co.339 produces a good yield, and is adaptable to a wide range of soil conditions. N : Co. 293 is resistant to red rot, but susceptible to mosaic. It is best adapted to high altitudes. N : Co.334 is relatively resistant to smut and mosaic and does well in sandy soil, producing a stiff upright cane. N : Co.292 gives a fair yield and is relatively resistant to smut and mosaic.

2856 COELHO, C.

Melhoramento da cana de açúcar em Pernambuco. (Breeding sugar cane in Pernambuco).

Bol. Sec. Agric. Pernambuco 1952 : 19 : 225-31.

Crosses were made by surrounding the female inflorescence with 4-5 male inflorescences with their stalks in jars of nutrient solution. Selection is carried out on the one-year seedlings, which are grown in proximity to a mosaic-infected variety to enable selection for resistance to be made. In lattice square tests carried out in 1946 with 10 of the selections, all were superior to Co.331 in sucrose content and 3 of them in total yield of sugar; 7 of them gave higher yields of sugar per hectare than the standard CP27-139.

2857 **Chambre d'Agriculture de l'Ile Maurice. Rapport du Président sur l'exercice 1951/52. (Chamber of Agriculture of Mauritius. Report of the President on the financial year 1951-52).**

Rev. Agric. Maurice 1952 : 31 : 161-88.

The sugar cane M 423/41 has been tested and

found equal to M 134/32 in yield up to the fourth ratoon stage, but inferior in sugar content during the last two years.

The variety E 1/37, bred on the Highlands estate and released in 1951, has shown a high sugar content and yield of cane and seems specially suited to the damper localities in Mauritius.

Trials of new Barbados canes show B 37161 to be the most promising.

2858 Twenty-second Annual Report of the Sugarcane Research Station, Colony of Mauritius for 1951 (1952) : Pp. 37.

During the season many varieties which had not flowered for several years arrowed profusely at Réduit, Black River and Pamplémousses; crosses were therefore made involving RP 8, BH 10/12, SC 12/4 and Black Tanna. Other intervarietal and interspecific crosses with particular objectives covered a wider range than usual. Yield trials of local seedlings and ratoons of different ages and introductions from Barbados are reported. Progenies from M 112/34 x M 63/39 were outstanding for their high sugar content combined with vegetative vigour. Considerable promise was shown by M 11/43 and M 31/45. Ebene 1/37 was added to the list of approved varieties (cf. Abst. 1800).

2859 DE SORNAY, A.
Vingt-sixième Congrès Sucrier de la South African Sugar Technologists' Association. (Twenty-sixth Sugar Congress of the South African Sugar Technologists' Association).

Rev. Agric. Maurice 1952 : 31 : 189-97.

An account is provided of the above Congress in French for growers and breeders in Mauritius.

2860 WILLCOX, O. W.
Why cane varieties deteriorate. An explanation of the reason for "running out."

S. Afr. Sug. J. 1953 : 37 : 171-73.

It is suggested that the deterioration of sugar cane varieties, developed by hybridization, may be due to the gradual loss of initial hybrid vigour.

2861 M-L., H.
Some observations on sugar cane genetics.

Int. Sug. J. 1953 : 55 : 33-34.

The possibility of determining, through progeny analysis, those varieties which readily transmit desirable characters is discussed. Particular reference is made to the influence of polyploidy,

the heterozygous nature of chromosome complements and cytoplasmic inheritance, which render infinite the odds against securing desired combinations.

2862 KING, N. J.
The ratoon stunting disease problem.
Aust. Sug. J. 1953 : 45 : 29-33.

The widespread occurrence of the virus causing ratoon stunting of sugar cane in Queensland is discussed, in relation to the persistence of some varieties, now known to be resistant, and the necessity for continual replacement of others which become progressively more diseased each year. It is suggested that decline in yielding ability in other countries may be caused by similar viruses.

2863 FERGUSON, H. S.
Sugar cane trials of the flood plains of the Bahr el Jebel in the Anglo-Egyptian Sudan.
Bull. Sudan Min. Agric. 1951 : No. 6 : Pp. 51.

Trials from 1940 to 1946 have shown that in the flood plain of the upper White Nile between Rejaf and Bor, Co. varieties were more resistant to drought than the POJ varieties; Co. 205 was particularly disease-free.

2864 M-L., H.
The sugar cane in British Guiana.
Int. Sug. J. 1953 : 55 : 59-60.

Varietal trials carried out in 1951 are reviewed (cf. Abst. 2104). A comparison between yields obtained during the current year and 20 years ago illustrates the value of improved cane varieties, including those introduced from Barbados in recent years.

2865 HASKEW, H. C.
Varietal trials—1952 season.
Cane Gr. Quart. Bull. 1953 : 16 : 144-54.

The results of trials of local sugar cane varieties and a few introductions, including N : Co. 310 (cf. PBA, Vol. XVI, Abst. 561), are reported from different parts of Queensland.

2866 Try Tracy—new mid-season sirup sorgo for Mississippi.

Sth. Seedsman 1953 : 16 : No. 6 : p. 78.

The new sweet sorghum Tracy, released by the Mississippi Agricultural Experiment Station in cooperation with the US Department of Agriculture, matures at the same time as White African. It is expected to compete with the latter throughout Mississippi, since it surpasses White African with respect to lodging resistance and stalk yield, and gives 11% more syrup per

acre. Tracy is comparable with White African in resistance to leaf anthracnose, zonate leaf spot (*Gloeocercospora Sorghi*), red rot (*Colletotrichum graminicolum*) and rust (*Puccinia purpurea*).

2867 Proceedings of seventh general meeting, 1952 of the American Society of Sugar beet Technologists : Pp. 809.

Dahlberg, H. W. Research work in sugar beet breeding. (pp. 10-14).

Breeding by the Great Western Sugar Company is discussed, with reference to the association between high sugar content and low sodium content, desirability of low raffinose content, reduction of sugar losses during storage, and resistance to leaf spot and other diseases and to cold.

Ulrich, A. Variability of open-pollinated, inbred and hybrid sugar beet varieties in greenhouse experiments. (pp. 67-72).

When tested under six different conditions of day length and temperature, inbreds and hybrids did not show a consistent reduction in variability compared with open-pollinated varieties. Either the improvement in genetic uniformity in the inbreds and hybrids had been slight, or the experimental technique had masked any decrease in variability. In choosing a measurement as a means of studying growth changes, the ratio of treatment variance to the error variance (F value) should be considered, as well as the coefficient of variation.

Ulrich, A. Growth and development of open-pollinated, hybrid and inbred sugar beet varieties in controlled climates. (pp. 73-84).

In most varieties sucrose weight per plant, root weight, sucrose percentage of the root, top weight, fresh weight of the leaf blades and number of living blades at harvesting were greater under long day than short day conditions, and at the lower temperatures of an 8-hour day. The total number of leaves produced was similar for all the controlled climates, except the warmest. The relative performance of each variety was not the same under each set of conditions. Hybrid vigour was expressed only at the lower temperatures. The genetical importance of experiments on plants raised in controlled climates is stressed.

Went, F. W. Rate of photosynthesis in young sugar beet plants. (p. 85).

Varietal differences have been observed in rate of photosynthesis.

Peto, F. H. Effect of frost on sugar content in beets. (pp. 108-11).

Marked varietal differences in frost resistance were noted in Alberta during 1951; the Polish variety Udydz A was particularly resistant. The considerable variation in frost resistance existing among Canadian stocks suggests the possibility of breeding for this character.

Gaskill, J. O. Induction of reproductive development in sugar beets by photo-thermal treatment of young seedlings. (pp. 112-20).

A detailed account is given of shortening the life cycle by exposing seedlings to prolonged low temperature and continuous light (cf. Abst. 535).

Johnson, R. T. A comparison between corn and sugar beet breeding methods. (pp. 296-306).

After a comparison of the earlier phases of maize and sugar beet breeding, the production of hybrid sugar beets is discussed in relation to the methods of hybrid maize breeding. Among the problems of sugar beet improvement discussed are the following: the use of lines of type O beets in the development and maintenance of inbreds and their male sterile equivalents, type O beets being those so genetically constituted that when crossed on to a male-sterile line all the offspring are male sterile (cf. *PBA*, Vol. XVI, Abst. 858); the relative value of inbreds and self-sterile lines as parents in crosses with male-sterile forms to produce commercial hybrids; the possible economic advantages of developing three-way crosses instead of single hybrids; testing for general combining ability; and the applicability of maize breeding techniques such as early testing of inbreds, gamete selection, recurrent selection and multiple convergence.

Doxtator, C. W. & Bauserman, H. M. Chemical constituents of five varieties grown in six midwestern factory areas. (pp. 307-13).

The juices of five varieties differed significantly in sucrose, Na, K, Mg, Cl and total N percentages, expressed as averages for all six localities. Locality, however, had a much greater effect upon sucrose yield and juice quality than variety. Varietal characteristics of the juice differed according to the test locality, the greatest variability being shown in the sucrose, Na and Ca percentages. Correlations were determined between eight juice constituents. Sucrose and Ca percentages were positively correlated. Sucrose percentage was negatively correlated with Na and Cl percentages.

Brown, R. J. & Wood, R. R. Improvement of processing quality of sugar beets by breeding methods. (pp. 314-18).

Selection for low content of Na has proved effective. Heritable differences in raffinose have been detected. Methods for the mass determination of Na, K, raffinose, Ca and Mg contents in selection are outlined.

Doxlator, C. W. & Bauserman, H. M. Parent-progeny tests for sodium and potassium content. (pp. 319-21).

The results of two years' testing of selected progenies derived from a variety high in sucrose content and low in Na and K content indicate that improvement in sugar content and reduction in Na content have been achieved. The parent variety and selected progenies did not show appreciable differences in K content.

Hac, L. R., Long, M. L., St. John, G. A. & Walker, A. C. Relationship between root weight, glutamic acid and sucrose content of inbred lines of sugar beets. (pp. 322-30).

The inbreds exhibited marked differences in root weight and percentages of sucrose and glutamic acid. Correlation data indicated that selection of lines with high sucrose content and either a high or low percentage of glutamic acid should be possible. The general similarity of related inbreds with respect to glutamic acid percentage suggests that this character is inherited.

Savitsky, V. F. A genetic study of monogerm and multigerm characters in beets. (pp. 331-38).

The multigerm character was incompletely dominant in the F_1 of crosses of the monogerm inbred SCL 101 with multigerm beets. In the F_2 populations, multigerm and monogerm plants showed a 3 : 1 segregation. The recessive gene pair for the monogerm condition has been designated *mm*. Modifiers derived from the multigerm parents may influence the expression of the monogerm character, a few double-germ fruits appearing on monogerm plants. A gene for late bolting and *m* were linked.

Savitsky, H. Selective fertilization studies and recovery of self-sterile from self-fertile races of monogerm sugar beets. (pp. 339-43).

In developing self-sterile monogerm beets from hybrids between the self-fertile monogerm race SCL 101 and multigerm varieties, the following procedures are necessary: (1) production of back-cross populations from crosses between self-sterile multigerm plants and the self-fertile

F_1 hybrids, to obtain segregation for self sterility and fertility; (2) selection of self-sterile plants in the BC_1 , and of monogerm individuals in the succeeding generation; and (3) identification of self-sterile plants on the basis of fruit and ovule development at the time of flowering (cf. *PBA*, Vol. XXI, Abst. 2895). The character pairs self sterility vs. self fertility and multigerm vs. monogerm are controlled by an allelic series of *S* genes (cf. *PBA*, Vol. XIII, Abst. 255) and the factor pair *Mm*, respectively; a BC_1 progeny therefore comprises four genotypes: $MMSfS^1$, $MmSfS^1$, MMS^1S^2 and MmS^1S^2 . Four possible methods of continuing work on the development of monogerm lines are discussed genetically: crossing the self-sterile BC_1 plants (1) among themselves, (2) with pollen from F_1 hybrids derived from crosses between SCL 101 and any valuable self-sterile multigerm variety, and (3) with F_2 monogerm beets; and (4) hybridization of F_2 monogerm plants with self-sterile multigerm plants.

Open pollination of self-sterile BC_1 plants and hybridization of these plants with F_1 hybrids have both given good experimental results with respect to the production of self-sterile monogerm segregates.

Savitsky, V. F. Methods and results of breeding work with monogerm beets. (344-50).

Diverse types of monogerm beets have been developed from crosses of the monogerm line SCL 101 with sugar beets, mangels, red table beet and Swiss chard in investigations by the US Department of Agriculture.

F_2 multigerm segregates show a pronounced correlation between number of flowers per cluster and weight of 1000 seed-balls. Monogerm F_2 segregates, however, exhibit an amplitude of variation in seed-ball weight approaching that of multigerm beets. Selection for fruit size (diameter or weight) and type of inflorescence has proved successful in both monogerm and multigerm types. Methods of securing monogerm varieties from F_2 and F_3 lines and of developing elite self-sterile monogerm beets by back-crossing are discussed, explanatory charts being provided. Use of monogerm lines in inbreeding and the exploitation of heterosis are also considered.

Peterson, D. F. Inbred seed production in progeny classification for type O plants in open-pollinated varieties. (pp. 351-53).

Results are reported which suggest that under the environmental conditions at Sheridan, Wyo.,

type O plants isolated in self-sterile varieties can be maintained by self pollination.

Ryser, G. K. & Savitsky, V. F. *Sugar percent in progenies derived from hybrids to monogerm sugar beets.* (pp. 354-59).

Study of variation in sugar percentage of the F_2 and first back-cross populations of crosses of self-sterile multigerm varieties with the monogerm line SLC 101 indicates that this inbred improves the sugar percentage of its hybrid derivatives. In back-crossing to combine the monogerm character with resistance to a disease, alternate use of tonnage and sugar types resistant to the disease is recommended; in this way a greater number of hybrid populations with desired combinations of yield and sugar percentage can be developed. The first back-cross hybrids SL 824 (US 35/2) x (Ovana half-sugar fodder beet x SLC 101) and SL 824 x (Egyptian red table beet x SLC 101) gave outstandingly high yields of both roots and sugar, exceeding the commercial variety US 22/3 by 45% and 33%, respectively, in sugar production per acre.

Oldemeyer, R. K. & Bush, H. L. *Influence of geographical locations and type of bag on selfed-seed setting for sugar beets.* (pp. 360-63).

Considering the data for tests carried out in Colorado during 1950 and 1951, no great differences in the setting of selfed seed of two commercial varieties were obtained at the places where most setting occurred. The results are discussed in relation to the mean temperature at anthesis. In most cases, a better set was secured by using white bags than Kraft bags. Lower temperatures within the white bags and increased light transmission are probably responsible for their superiority.

Stewart, D. *Observations on F_2 and F_3 generations of the sugar beet hybrid, leaf spot resistant multigerm x monogerm SLC 101.* (pp. 364-70).

Monogerm plants recovered in the F_2 of crosses of two leaf-spot resistant, multigerm varieties with the monogerm line SLC 101 exhibited conspicuous differences in fruit and seed size. Among 200 monogerm F_2 plants, 43.5% produced seeds larger than those of SLC 101, but only one F_2 individual produced seeds as large as its multigerm parent, US 216. F_3 lines with greater leaf-spot resistance, vigour and seed size than SLC 101 have been secured, but their productivity is below commercial level. The lines are strongly self fertile, a character inherited from SLC 101; cytoplasmic male

sterility could be introduced to overcome the problem of self fertility in the production of hybrid seed.

Owen, F. V. *Mendelian male sterility in sugar beets.* (pp. 371-76).

A gene, a_1 , for pollen abortion has been identified in four widely different races. It has no relationship with previously discovered cases of cytoplasmically determined male sterility, and is inherited independently of x and z , which modify the effect of cytoplasmic male sterility, R for red hypocotyl, Tr for spotted leaves and m for the monogerm character. Another gene (a_2) for pollen abortion was found in material from England. Since it makes possible the elimination of back-crossing, genic male sterility should be useful in introducing heterozygosity into self-fertile inbreds. In back-crossing, it is suggested that B for bolting should be used in conjunction with a gene a . In the presence of B , three to four generations could be raised in a single year, with the aid of high temperatures and continuous illumination. Both B and a could be eliminated from the final inbred by selfing.

Namazie, J. & Kohls, H. L. *Attempts to induce parthenogenesis in sugar beets.* (pp. 377-81).

Attempts to induce homozygous lines of male-sterile sugar beets parthenogenetically, by treating the stigmas with different compounds, as suggested by Tschermak, were unsuccessful.

Peterson, D. F. & Cormany, C. E. *A new leaf-spot-resistant variety.* (pp. 382-83).

Two leaf-spot resistant sugar beet varieties, MW 111 and MW 131, have been selected by the Holly Sugar Corporation for the Arkansas valley in Colorado. MW 111 has given a 13% higher yield of gross sugar than the commercial control (US 215 x US 216) during a five-year period; it was released in 1952. In tests for the three years, MW 131 has shown a 21% increase; it is to be released in 1954.

McFarlane, J. S. & Price, C. *A new non-bolting, curly-top-resistant, sugar beet variety, US 75.* (pp. 384-86).

The above variety, a selection of US 22/3, is being released for seed production. US 75 is similar to US 56/2 in bolting resistance; it equals its parent in curly-top resistance and possesses a higher degree of resistance to downy mildew. It has given promising results in limited yield trials in California.

Murphy, A. M. & Savitsky, V. F. *Breeding for resistance to curly top in hybrids with monogerm beets.* (pp. 387-89).

The behaviour of the parents, F_1 , F_2 and first back-cross generations of crosses of the monogerm lines SLC 101 and SLC 107 with curly-top resistant, multigerm varieties is described with respect to their reactions to curly top. Selection of F_2 plants under conditions of severe infections has resulted in monogerm lines possessing a high degree of resistance.

Murphy, A. M., Ryser, G. K. & Owen, F. V. *Performance of F_1 hybrids between curly-top-resistant and curly-top-susceptible sugar beets.* (pp. 390-92).

F_1 hybrids between curly-top resistant male-sterile female parents and susceptible pollinators were tested in three localities. The hybrids exhibited an intermediate degree of resistance to curly top, and gave good yields of roots and sugar under conditions of mild to moderate attack. Two hybrids involving a recent introduction of Klein E from Germany were particularly promising; under severe conditions of infection one produced a slightly higher yield than the commercial variety US 22/2, which possesses a relatively high degree of resistance.

Downie, A. R. ET AL. *Reaction of sugar beet strains to Aphanomyces cochlioides at three different locations.* (pp. 393-95).

The results of trials of 16 selections in three different states are summarized. Strains selected for *Aphanomyces* resistance showed resistance to severe attacks of this disease at all three centres. Strains selected for resistance to *Rhizoctonia* and southern root rot were susceptible to *Aphanomyces*.

Gaskill, J. O. *Progress report on breeding for storage-rot resistance in sugar beets.* (pp. 396-99).

Sixteen of the 19 progenies derived from mother beets selected from the variety US 226 for resistance to storage rot had lower average percentages of rot than US 226, the difference being significant in the case of six progenies.

Nelson, R. T. & Oldemeyer, R. K. *Preliminary studies applicable to selection for low respiration and resistance to storage rots of sugar beets.* (pp. 400-06).

Methods of determining respiration rates and resistance to storage rot for individual roots are described. The techniques are considered to be

valid for selection between inbreds, using several beets of each line.

Wood, R. R. *Selection for cold tolerance and low temperature germination in sugar beets.* (pp. 407-10).

Selection for germinating ability at low temperature (34-36°F) has given positive results in investigations by the Great Western Sugar Company, Colo. Preliminary data suggest that selection for seedling resistance to frost may also be effective.

Smith, C. H. *Heritable differences in germination of sugar beet seed at low temperatures.* (pp. 411-14).

Apparently heritable differences between varieties have been shown in rate of germination and seedling vigour at low temperature (36°F). A brief discussion is given of the use of laboratory tests of germination under low temperature and other conditions in selection, and of suitable techniques.

McFarlane, J. S. *Breeding for resistance to downy mildew in sugar beets.* (pp. 415-20).

Improved resistance to downy mildew in the field has been obtained by selection at the seedling stage under controlled greenhouse conditions at Salinas, Calif. Resistance can be obtained more rapidly by selection within self fertile lines than cross-pollinated varieties and selections, since the progenies of individual plants can be tested. Self-fertile breeding stocks could be easily established by incorporating the gene S^t (cf. *PBA*, Vol. XIII, Abst. 255).

Ryser, G. K. & Crandall, B. H. *Adaptation of the IBM card system to analysis of sugar-beet varietal data.* (pp. 421-25).

The IBM punched card system for analysing varietal data is discussed, on the basis of its use at the Utah State Agricultural College.

Walker, A. C., Hac, L. R. & Price, C. *Measurement of the difference between "sugar type" and "yield type" sugar beets.* (pp. 426-33).

Methods are described for determining the direction of the most significant difference between varieties, in terms of combinations of measurements of sucrose percentage, glutamic acid percentage and root yield per acre. Storage potential, the primary discriminant function calculated, differentiates varieties even under conditions of widely diverse conditions of soil fertility. Beets of high storage potential are of the sugar type, with high percentages of sucrose

and glutamic acid and low root yield; those of low storage potential represent the yield type, with low percentages of sucrose and glutamic acid and high root yield. A secondary discriminant, perpendicular to the storage potential, is designated the growth potential. At adequate N levels, the greater the growth potential the higher the glutamic acid content; thus the tonnage type had, unexpectedly, a relatively high glutamic acid percentage. The residual independent variation was also calculated, this function being termed the nitrogen status.

Artschwager, E. Sugar beet types based on internal morphology. (pp. 434-40).

Type formulae and descriptions based upon internal features of the root are given for 13 selections. In eight highly inbred lines studied the diagnostic characters were constant, with the exception of size of core and innermost vascular ring. The variability of these two characters did however exhibit definite trends.

Coons, G. H. ET AL. Report of the 1951 evaluation tests of leaf spot and black root-resistant sugar beet varieties of the United States Department of Agriculture. (pp. 445-51).

A report is given of extensive trials of the hybrids US 225 (male sterile) x US 226 and US 225 (male sterile) x a synthetic variety of four lines, the synthetic SP 501800-00, and selections resistant to black root (*Aphanomyces cochlioides*). The yields and sucrose percentages of the latter were both high. The performance of three accessions, 1170, 1173 and 1177, possessing resistance to both black root and leaf spot, was especially promising.

Stewart, D. & Gaskill, J. O. Results of field tests with triploid sugar beets in 1951. (pp. 452-53).

The yields of roots and gross sugar of triploids obtained by crossing colchicine-induced tetraploids of US 215 and US 216 with unrelated diploids were comparable with those of diploid hybrids produced by mating related lines. The importance of using as parents tetraploids which have been derived from diploids with good combining ability is stressed.

Stewart, D. & Campbell, S. C. The dispersion of pollen in sugar beet seed plots. (pp. 459-69).

Pollen dispersion was studied at Beltsville, Md., and Medford, Ore., using a strain of US 215 to pollinate a partially male sterile form of US 216. The former has the genotype RR for colour of the hypocotyl and other plant parts; the latter is a homozygous recessive for *r*; F₁ hybrids

between the two strains were recognized by their pink hypocotyls. In plots of similar size and design, a 4-row strip of the pollinator did not result in appreciably higher percentages of hybridization than a single row. Distance and rate of decrease in concentration of R pollen showed an exponential relationship. With a 4-foot interval between mother strain and pollinator, hybridization was reduced by 16.28%, in terms of the amount occurring in the row adjacent to the pollinator. The results are discussed in relation to the problems of poly-crossing and hybrid seed production.

Savitsky, H. Polyplod sugar beets—cytological study and methods of production. (pp. 470-76).

Immersion of the cotyledons and upper part of the hypocotyls in 0.3-0.5% colchicine solution is considered to be the most satisfactory method of inducing tetraploids by seedling treatment. Duration of the treatment beyond the shortest period used (7.5 hrs.) was not an important factor. The younger the seedlings, the higher the percentage of 4*n* plants. Pollen grain size has provided the best means of recognizing 4*n* plants after treatment. Irregularities in meiosis in tetraploids may lead to the appearance of some aneuploids.

Fife, J. M. & Price, C. An improved method for packing sugar beet roots to be stored for breeding purposes. (pp. 477-81).

Roots stored in pine shavings for 250 days at 40°F were still in good condition.

Report of indexing of inbreds. (pp. 482-87).

Problems of the cooperative testing and cataloguing of sugar beet inbreds are discussed.

Downie, A. R., Schuster, M. L. & Oldemeyer, R. K. Cooperative field testing of strains of sugar beets for resistance to several root rotting organisms. (pp. 557-61).

The results suggest that sources of resistance to different root rots exist, and that combination of resistance to more than one root rot in a single variety may be possible. In tests on naturally infested soils, strain ACS 9-604-0 exhibited tolerance of *Aphanomyces*, *Rhizoctonia* and *Sclerotium* rots; GW 304 was tolerant of rots caused by *Fusarium* and *Rhizoctonia*.

Afanasiev, M. M. & Morris, H. E. Resistance and soil treatments for control of Rhizoctonia of sugar beets. (pp. 562-67).

Considerable varietal differences in reaction to

Rhizoctonia root rot were shown in tests at the Huntley Substation, Mont.

Gaskill, J. O. *A study of two methods of testing individual sugar-beet roots for resistance to storage pathogens.* (pp. 575-80).

Descriptions are given of two techniques of inoculation with *Botrytis* and *Phoma*, tentatively regarded as suitable for selection for resistance to storage rot; progeny tests have not yet been carried out.

2868 JOHNSON, R. T.

A progress report on the sugar beet breeding program.

Spreckels Sug. Beet Bull. 1953 : 17 : 12-13.

Research carried out by the Spreckels Sugar Co., Calif., has led to the development of self-fertile strains, breeding true for the monogerm character and possessing other desirable qualities. Vigorous hybrids have been obtained by crossing these lines with a male-sterile sugar beet bred by the US Department of Agriculture. Selection for ability to germinate at low temperatures has resulted in the production of a strain showing 46% germination after 10 days at 42°F.

STIMULANTS

2869 Communications présentées à la Conférence Européenne du Tabac. Rome, 10-13 Septembre 1950. (**Communications presented to the European Conference on Tobacco. Rome, 10-13 September 1950.**)

Rome 1951 : Pp. 377.

The following papers of interest to plant breeders were communicated:—

Alcaraz Mira, E. & Caridad Igelmo, J. M. *Trabajos genéticos para la obtención de razas de tabaco mejorando la combustibilidad.* (*Genetical work for producing tobacco varieties with improved combustibility.*) (pp. 7-21).

Combustibility was measured by applying an incandescent needle to the dried leaves of a number of varieties and hybrids. Very high combustibility was observed in some hybrids of Híbrido 20 x Valencia and some of them are also promising as regards morphological features. The results showed that combustibility was determined by multiple genes.

Alcaraz Mira, E. *Variedades de tabaco resistentes al mosaico ordinario.* (*Tobacco varieties resistant to common mosaic.*) (pp. 25-39).

Data are presented regarding the mosaic resistance of hybrids obtained from crossing Ambalema with Kentucky, Valencia, Maryland, Filipino and Habano. Most of the resistant hybrids showed strong resemblances to the Ambalema parent and were useless for practical purposes. Hybrid 60 however, from Ambalema x Filipino, was promising in habit, quality of leaf, combustibility and aroma, and has been used as resistant parent in a series of further crosses; several promising resistant hybrids were obtained from these crosses and are described. All have proved much more resistant than the American White Burley containing the *N* gene from *Nicotiana glutinosa*, and under favourable conditions of cultivation give a second crop often larger than the first, whereas with the susceptible varieties it is rarely possible to get a second crop at all. Hybrids 230-B (Hybrid 60 x Filipino) and 225 (Hybrid 60 x Hybrid 216) are specially promising in yielding ability.

Alcaraz Mira, E. & Izquierdo Tamayo, A. *La tetraploidía inducida por la colchicina en el género Nicotiana.* (*Tetraploidy induced by colchicine in the genus Nicotiana.*) (pp. 43-53).

By treatment with 0.2% colchicine solution, tetraploids have been obtained in a number of tobacco varieties and descriptions are given of those from the *N. rustica* variety Hemelowka (Chmelowka) and the *N. Tabacum* variety Hybrid 196-A. Both are characterized by meiotic irregularities, reduced fertility and much lower rate of seed production, though the individual seeds were larger. Selection for number and weight of seeds in the selfed progenies of the Chmelowka tetraploid led to increased fertility. One of the progenies was 30% higher in nicotine content than the diploid, which it also exceeded in yield. Some of the tetraploids of the *N. rustica* variety Ervasanta contained up to 8% of nicotine.

Bolsunov, I. *Étude des formes tétraploides de Nicotiana rustica L. et de leur valeur économique.* (*A study of tetraploid forms of Nicotiana rustica L. and their economic value.*) (pp. 81-93).

This conference address is based on the author's work in Austria since 1948 on diploid and tetraploid varieties of *N. rustica*, including the high yielding Chmelowka and the four varieties Stemas, Ssamosadka, Zlatka and Zlag, which

have a high nicotine content. By 1950, the F_5 and F_8 from tetraploids obtained by acenaphthene treatment were found to differ from the normal diploid forms in the same respects as those previously recorded by many other investigators. While suggesting that the greater resistance of his $4n$ forms to *Bacterium tabacum* may be due to their slower growth, the speaker pointed out that all his $4n$ plants were less drought resistant, possibly because of their larger cells and weaker root system. There was no difference between the $2n$ and $4n$ plants as regards the tendency to develop lateral buds. The phenotypic changes induced in the tetraploids differed with the variety: in Ssamosadka and Zlag the yield was less than half that of the diploids, while in Chmelowka and Stemas the loss was much less.

As evidence that the artificial induction of tetraploidy favours mutation, the occurrence is mentioned of an *aurea* mutant in the F_4 from a tetraploid whose original parents were pure lines not of the *aurea* type. Since the *aurea* character is bifactorially conditioned in the diploid, four pairs of allelomorphs must have mutated simultaneously.

The tetraploids surpassed the diploids in nicotine content except when topping was carried out, in which case their nicotine content might be equal to, greater or less than that of the $2n$ plants. Possible reasons for this are discussed.

In general, forms with an increased nicotine content have not yielded well, except the $4n$ line of Stemas.

Experiments on the possibility of fixing heterosis in intraspecific crosses by inducing tetraploidy proved negative.

Huter, R. *Quelques aspects de la production du White Burley en Suisse. (Some aspects of the production of White Burley in Switzerland).* (pp. 209-14).

Opinions are cited regarding the origin of the variety Burley and an account is given of the breeding of a White Burley type to meet commercial requirements in Switzerland. The new selection is completely satisfactory as regards uniformity and quality.

Koenig, P. *Aperçu sur les travaux réalisés par l'Institut Expérimental du Tabac à Forchheim près Karlsruhe-Baden. (Review of the achievements of the Experimental Institute for Tobacco at Forchheim near Karlsruhe, Baden).* (pp. 239-43).

The above mentioned institute has published a

survey of the authorized types of tobacco grown there, with descriptions of all the German types and illustrations of their leaves, accompanied by information on their exploitation.

Tobaccos that are nicotine-free or have a low nicotine content have been further improved. Strain 17, a giant type with about 40 leaves, is likely to be of practical value.

Ollero Gómez, A. & Cota Galán, R. *Método rápido y sencillo para determinar la nicotina con el objeto de seleccionar plantas de tabaco por su contenido en alcaloide. (Rapid and simple method of determining nicotine with the object of selecting tobacco plants for their alkaloid content).* (pp. 265-83).

After a review of various methods of estimating nicotine content on small samples, a description is given of a rapid method based on extraction by trituration of the fresh leaves with glass and colorimetric determination of the alkaloid by addition of β -naphthylamine and cyanogen bromide.

Perucci, E. *Gli ibridi di prima generazione. (First-generation hybrids).* (pp. 299-305).

Among the advantages of F_1 seed, better germinating capacity, greater vigour of the seedlings, earlier maturity and greater ability to withstand the attack of insects, diseases and climatic adversities are mentioned as well as higher yield. The author has elaborated a method of producing hybrid seed of tobacco on a commercial scale; some 63 kg. of seed can be obtained from 3700 plants of Resistente 142 pollinated by Big Cuban and the hybrid is known as Resistente Italia.

2870 *Relazione tecnica anno 1952. (Technical report for 1952).*

Tabacco, Roma 1953 : 57 : 135-53.

Reference is made to a number of improvements effected in the three branches of the Istituto Scientifico Sperimentale per i Tabacchi [Tobacco Research Institute] in Italy. An examination is being made of the quality of various selections from standard varieties and of a number of hybrids, and commercial F_1 seed is being produced of the hybrid Cucchetto x Gojano creso. Tobaccos from the Levant and certain subtropical varieties are under observation.

The genetics section is studying the effect of Gammexane as a polyploidizing agent, the production of mutants by use of chemical agents, the chromosome aberrations in ageing seed going back as far as 1940, meiotic studies on certain polyploids and interspecific hybrids, and

F₁ hybrids from mosaic-resistant American tobaccos.

2871 LATTANZI, A.

Uno sguardo sintetico alla coltivazione dei tabacchi levantini negli Abruzzi. (**A comprehensive glance at the cultivation of oriental tobaccos in the Abruzzi**).

Ist. Sci. Sper. Tabacchi, Roma 1951 : Pp. 95.

This monograph includes descriptions of the oriental tobaccos grown in the Abruzzi region of Italy, the various selections that are at present under observation, the morphological characteristics of the leaves, flowers and seeds and details of the biology of flowering.

2872 BOLSUNOV, I.

L'obtention de variétés ultra-productives comme but actuel de la sélection moderne des tabacs. (**Obtaining ultraproductive varieties as an immediate aim in breeding tobacco today**).

Free Treat. World Tob. Congr., Amsterdam 1951 : 2 : 39-63.

Drawing on his 22 years of research on the breeding of *Nicotiana rustica*, the speaker gave the World Tobacco Congress at Amsterdam (1951) a discourse on the method and trends of research that have been followed in various European countries and the USA in endeavouring to combine high quality with high yield.

2873 BOLSUNOV, I.

Quelques idées relatives à l'organisation d'une protection internationale des obtentions des sélectionneurs de tabac. (**A few ideas concerning the organization of an international scheme for the protection of the products of tobacco breeders**).

Free Treat. World Tob. Congr., Amsterdam 1951 : 2 : 89-95.

The substance of this paper has already been reviewed from another source (cf. *PBA*, Vol. XXII, Abst. 2887).

2874 BOLSUNOV, I.

Experiments conducted with world's most precocious tobacco variety.

Tobacco, NY 1952 : 135 : No. 26 : p. 28.

A variety of *Nicotiana Tabacum*, found on the frontier between Siberia and Manchuria, matures 1½ months after transplanting at the Tobacco Breeding Station, Fuerstenfeld, Austria, where it has been named *Praecox*. Its early maturity is unequalled, but only a few small leaves have

been produced in trials in different parts of Europe.

2875 ALCARAZ MIRA, E.

Genética del tabaco. (**Genetics of tobacco**).

Euclides, Madr. 1953 : 13 : 160-63, 204-15.

An outline of the subject is given for the benefit of Spanish-speaking readers, indicating the main sources of further information. The topics to which particular attention is devoted are studies of factorial analysis and their bearing on the evolution of the *Nicotiana* species and the inheritance of resistance to diseases. A table is given showing the characters that have been studied genetically, the number and type of genes responsible and the author.

2876 LOLLICHON, F.

La production des tabacs de coupe au Cambodge. (**The production of tobaccos for cutting in Cambodia**).

Arch. Rech. Agron. Cambodge Laos Vietnam 1952 : No. 16 : Pp. 48.

Aspects of tobacco production in Cambodia are discussed, with comments on chemical and physical factors affecting quality and on the environmental conditions and their effect upon the product of the grower.

The present work of the Tobacco Division of the Centre for Scientific and Technical Research in Indochina is illustrated by examples of successful selections from Hungarian, Virginia, Cabot and other types of tobaccos. Collections of pure stocks have been established and the lines which future breeding operations may follow are suggested.

2877 WILKINSON, J.

Some effects induced in *Nicotiana glutinosa* by the 'aspermy' virus of tomato.

Ann. Bot., Lond. 1953 : 17 : 219-23.

General malformation and stunting of *N. glutinosa* inoculated with the aspermy virus of tomato (cf. *PBA*, Vol. XXII Abst. 2326) was accompanied by necrosis of some anthers and ovaries, while those undergoing sporogenesis showed abnormal prolongation of all stages of the first and second meiotic divisions. Some pollen mother cells did not progress beyond the first prophase, because the pachytene threads collapsed and abnormal multiplication of nucleolar bodies occurred. Another common abnormality was the failure of pairing between the homologues of one, or more than one, bivalent. These unpaired univalents lagged at anaphase

and chromosome-deficient nuclei were produced. Similar aberrations were observed in ovule formation. The possibility that monosomic strains of *Nicotiana* may have arisen by the functioning of virus-induced chromosome-deficient gametes is discussed. In the present investigation, it is assumed that $n - 1$ microspores are noneffective because of certation.

2878 SCARASCIA, G. T.

Osservazioni su *Nicotiana glauca* e sul suo autotetraploide *Nicotiana diglauca* con particolare riguardo al loro comportamento meiotico. (**Observations on *N. glauca* and its autotetraploid *N. diglauca* with special reference to their meiotic behaviour**).

Tabacco, Roma 1953 : 57 : 122-32.

The characteristics of the tetraploid *N. glauca* are described; it displayed regular mitosis but in meiosis multivalent formation and other irregularities were frequent and the average number of seeds per capsule was 250-300 as against 800-900 in the diploid.

2879 KADAM, B. S. & RADHAKRISHNAMURTHY, B.

A new linkage in tobacco.

Nature, Lond. 1953 : 171 : 1028-29.

Linkage between the gene *Pt* for petiolate leaf and *Au*₀ for absence of auricle was found in a cross between two varieties of *Nicotiana Tabacum*, Lanka and Yellow Special.

2880 BOLSUNOV, I.

Virginia Bright Tobacco breeding in Austria and prospects thereof.

Tobacco, NY 1953 : 136 : No. 18 : 152-53.

The disadvantage of Virginia type tobaccos lies in their low yield, which can be increased either by selecting natural mutations or by crossing with giant tobaccos. Some of the new Austrian Virginia types, e.g. Great Virginia, Super Virginia, Virginia Excelsior, Colossus, Isida, Commodore and Virginia brillantea give increased yields.

Another breeding objective is the production of fine-leaved bright tobaccos, which is furthered by the selection of plants with short internodes. Two recently bred varieties with short internodes, Colossus and Excelsior, are to be tested this summer.

Attempts have been made to develop strains which yellow readily. Crosses between the readily yellowing Burley tobaccos and Virginia tobaccos have proved unsatisfactory, but crossings with the giant races have produced good results e.g. the varieties Aurea Austria and Yellow Dragon. The German Tobacco

Research Institute at Forchheim has also produced the readily yellowing variety Virginia Gold A.

In attempts to produce a variety with a low nicotine content, crosses between standard Virginia varieties and races with a low nicotine content have been effected. From these the variety Virginia Excelsior was obtained, with a nicotine content of 0.6%.

Virginia type tobaccos which only need to be suckered once have been produced e.g. Virginia Grandus, Virginia Commodore, Virginia Austria and Yellow Dragon.

2881 TIHVINSJKA, V. D.

(Mutual interaction between the stock and scion in tobaccos).

Bot. Ž. (Bot. J.), Kiiv 1950 : 7 : No. 3 : 24-37. [Ukrainian].

The effects of different stocks upon the chemical composition of *Nicotiana Tabacum*, *N. rustica*, *N. glauca*, *N. dirugla*, tomato and the F_1 , F_3 , F_7 , F_8 and F_9 of *N. Tabacum* x *N. glauca* were investigated. The evidence suggests that nicotine is accumulated in the roots of the nicotine-producing plants and anabasine in the roots and leaves of *N. glauca*. The sexual F_1 hybrids of *N. Tabacum* x *N. glauca* and of *N. rustica* x *N. glauca* synthesize both alkaloids in their roots, but in their leaves the nicotine changes into anabasine. The presence of nicotine and anabasine in the leaves of *N. Tabacum* when grafted on the F_1 of *N. Tabacum* x *N. glauca* or on *N. dirugla* (*N. rustica* x *N. glauca*) and of *N. rustica* when grafted on these stocks is attributed to some similar enzymic process.

2882 CHATTERJEE, B. G., RAMAMOORTHY, B., DAKSHINAMURTI, C. & GULATI, K. C.

Determination of nicotine in tobaccos.

Proc. Indian Acad. Sci. 1953 : 37 : Sect. B : 22-26.

A convenient and rapid method for estimating nicotine concentrations as low as 1 p.p.m., within $\pm 2\%$ error, has been developed at the Indian Agricultural Research Institute, New Delhi. The method involves extraction by steam distillation under pressure and spectrographic estimation. It is particularly useful for analysis of seedling selections in breeding.

2883 TERNOVSKIĬ, M. F.

(Intervarietal hybridization of tobacco).

Selekcija i Semenovodstvo (Breeding & Seed Growing) 1953 : No. 1 : 27-30. [Russian].

The direct and reciprocal hybrids between

Vengerskii Ogorodnyi [Hungarian Garden] and American 315, which surpassed all others in yield in the 1944 trials at Alma Ata, are no longer regarded as the best because of their tall habit and the poor quality of their leaves. It is suggested that Vengerskii Ogorodnyi should be superseded by some pale-leaved tobaccos, developed in recent years, such as the vegetative hybrids 86 and 87 or Ostrolist B [Narrow Leaf B]. The latter yielded well and produced good quality leaves when crossed with American 315, which shows resistance to mildew and mosaic. In recent years the immune vegetative hybrids 16, 26, 35 and 156 proved more vigorous than American 315, and the immune varieties Dubec 7 and Dubec Gigant 402-406 [Giant Dubec 402-406] produced leaves with a better aroma.

2884 Progress of tobacco research at Trelawney Station.

Rhod. Tob. J. 1953 : 5 : No. 3 : 53-57.

A review of research at Trelawney, Southern Rhodesia, mentions the recent development of mosaic resistant lines (cf. Abst. 1382). The quality and yield of these lines are being improved by hybridization with flue-cured varieties such as White Stem Orinoco, Jamaica Wrapper, Bonanza and Delcrest. Native types of tobacco, possessing resistance to common diseases and pests, have been sought in remote parts of the colony. One strain with a high degree of resistance to eelworm has been discovered, but many crosses will be necessary to incorporate other desirable qualities in this strain.

2885 BAHTADZE, K. E.

(A new large-leaved form of the tea plant).

Agrobiologija (Agrobiology) 1953 : No. 1 : 97-100. [Russian].

A hardy and vigorous China type with large leaves of good quality was obtained at Čakva, Georgia, by repeated pollination of a productive China tea plant with mixed pollen originating from the best plants in the plantation. Some hybrids reached the flowering stage. The material has been reproduced vegetatively.

2886 Seventeenth Annual Report of the Coffee Research and Experimental Station, Lyamungu, Moshi, Tanganyika 1950 (1953) : Pp. 40.

Clonal and seedling selection trials are reported, in which several selections have given outstandingly high mean annual yields of clean coffee per acre. Comparison of yields of clones and seedlings of the same mother trees

continued; in one experiment, the summary of results for six years shows no significant difference in yields; in another experiment, yields recorded for the tenth and twelfth years from planting out indicate a significant difference in favour of seedlings. Tree to tree variation is of the same order for clones and seedlings of the same parent. Bean density appears to be a genetic character.

2887 Un programa de selección del cafeto en Colombia. (A programme of coffee selection in Colombia).

Bol. Inform. Cent. Nac. Invest. Café 1953 : 4 : No. 38 : 15-30.

A review is presented of published literature on coffee breeding, followed by an outline of a breeding programme which is to be put into effect in Colombia.

2888 SANCLEMENTE PINEDA, M.

Problemas de incompatibilidad en el cacao. (Problems of incompatibility in cacao).

Acta Agron., Palmira 1953 : 3 : 65-88.

A substance was extracted from the pistils which when added to a nutrient solution inhibits germination of pollen incompatible with the plant from which it was extracted, stimulates the development of compatible pollen, and is destroyed by oxidizing agents such as H_2O_2 or $KMnO_4$. When these agents were applied in very weak solution to the pistils of certain self-incompatible trees, fruit was set on selfing; other trees failed to react in this way.

2889 BOWMAN, G. F.

The need for re-evaluation of selection programs for cacao.

Comun. Turrialba 1952 : No. 20 : Pp. 6. (Mimeographed).

It is argued that clonal selection should be based upon more precise knowledge of the actual factors affecting yield in any particular region. Ordinary seedling trees may give better yields than clones if adverse conditions tending to reduce yield are overcome. Characters which should be considered in clonal selection include resistance to disease and drought, vigorous root development, reaction to light intensity, season of production and high ratio of dry bean weight to fresh pod weight.

2890 FOWLER, R. E.

Características del Cacao Nacional. (Characteristics of National cacao).

Turrialba 1952 : 2 : 161-65.

The National cacao of Ecuador, which was

grown before the advent of the Forastero or Trinitario from Trinidad, was of very high quality until it became intercrossed with Trinitario. Its main characteristics are here described.

2891 PARHAM, B. E. V.

Cacao in Fiji—review and prospects.

Agric. J. Fiji 1952 : 23 : No. 2 : 14-24.

The merits of strains of Criollo and Forastero, introduced from 1880 onwards and subsequently abandoned, are discussed, with particular reference to the latest successful establishment of clones of the Trinidad selection ICS 7, obtained from Kew, and of Lafi 7, from Western Samoa. Both the recent introductions are Criollo x Forastero hybrids.

2892 KUPPERS, J. R.

Some biometric observations on cacao fruit.

Science 1953 : 117 : 354-55.

Data on measurements of (1) average weight of the individual fruit, (2) average weight of individual dry seeds, (3) average number of seeds per fruit and (4) average weight of dry cocoa per fruit were analysed with a view to finding a satisfactory criterion of weight of dry cocoa per fruit for selection. The trees sampled were derived from hybridization between Forastero and Criollo, the characters of the former predominating. Average weight of dry cocoa per fruit was significantly correlated with the other three attributes. Average weight of individual dry seeds was, however, the most dependable index of weight of dry cocoa. Size of fresh seeds, as judged visually in the field, should therefore also be a good index of cocoa yield.

2893 ANDERSSON, G.

Svalöfs Flora vallmo. (The Svalöf poppy Flora).

Sverig. Utsädesfören. Tidskr. 1953 : 63 : 56-62.

This new variety, obtained from a cross between the German varieties Mahndorfer and Peragis, has white petals with a violet spot like the parent varieties, but, as regards stem length, capsule shape and seed colour, is intermediate between them. As compared with Mahndorfer, it has stronger stems and less tendency to lodge, but its stem is not as strong as that of Peragis. It surpasses Mahndorfer in yield of seed and in oil content and crude fat percentage.

2894 **Annual Report of the Department of Hop Research, Wye College 1952 :** Pp. 70.

General report. (pp. 5-19).

Promising *Verticillium* wilt resistant seedlings

have been selected from crosses with wilt resistant males, in cooperation with the East Malling Research Station. Nonsuch, the variety showing the highest degree of wilt resistance, has been crossed with four resistant males, to obtain types with even greater resistance, for use in further breeding.

Triploids produced by open pollination of 4n forms of Bullion and Brewer's Gold have borne practically seedless cones, closely resembling those of the diploid parents in form, and in some cases also resin content and aroma.

No correlation has been found between richness of resins in the cones and number of resin glands per sq. cm. on the leaves.

Back-cross plants have flowered in an experiment designed to produce homozygous golden-leaved male plants for genetical and physiological experiments; only 1 male appeared in 3 families containing 33 females; the cause of this abnormal sex ratio is unknown.

A study is being made of the characters of American wild hops.

Dark, S. O. S. The use of polyploidy in hop breeding. (pp. 34-42).

A detailed account is given of the techniques of (1) treating young vegetative buds with colchicine, (2) isolating cuttings with 4n sectors, and (3) determining polyploidy by observations on stomatal length and by chromosome counts of the root tips of cuttings and their seedlings. Triploid seeds germinated more slowly than diploid and retained their viability longer. Triploids obtained by open pollination of chimeral tetraploids of Bullion and Brewer's Gold produce cones similar in size and type to those of the diploid forms, except for their seedlessness. They also show interesting variations in sex expression, a very high proportion bearing male flowers.

Salmon, E. S. The challenge cups for new varieties of hops. (pp. 66-67).

The results of the 1952 competition among growers are presented.

2895 ONO, T.

(Sex determination in hops).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : 32-33. (Abst.). [Japanese].

Sex ratios are given for normal 2x strains of European hops and *Humulus Lupulus* var. *cordifolius*, also for colchicine-induced 4x strains of these two groups, intergroup 4x hybrids, and intragroup and intergroup 4x x 2x hybrids. The results suggest that the sex-determining mechanism in *H. Lupulus* is similar to that in *Rumex acetosa* and *H. japonicus*.

2896 KELLER, K. R.

Seed germination in hops, *Humulus lupulus* L.

Agron. J. 1953 : 45 : 146-50.

In an investigation of factors influencing percentage germination, significant differences in respect of germinability were found between seed of open-pollinated lines collected in the USA. In no case, however, was the germination percentage so low that insufficient seedlings were available for breeding. It is assumed that differences were maternal, since all lines were pollinated with a random sample of pollen from a number of sources.

2897 KEYWORTH, W. G.

Resistance of hop stems to invasion by *Verticillium albo-atrum*.

Nature, Lond. 1953 : 171 : 656-57.

The results of grafting and stem inoculation experiments on the varieties OR 55 and Fuggle have suggested that the site of differential resistance to wilt is in the roots, the stems possessing equal resistance to the mild and virulent strains of the pathogen. Under conditions of mild invasion of the roots, stem resistance is high, but if infection is more severe, stem resistance is reduced or overcome.

2898 KEYWORTH, W. G.

***Verticillium* wilt of the hop. VI. The relative roles of root and stem in the determination of wilt severity.**

Ann. Appl. Biol. 1953 : 40 : 344-61.

A detailed account is given of experiments at East Malling Research Station, indicating that varietal resistance to *Verticillium* wilt depends primarily upon the resistance of the roots and that the normal stems of all varieties possess a similar and positive resistance (cf. Abst. 2897).

MINOR CROP PLANTS2899 HAGIWARA, T. & OOMURA [OMURA], Y.
(On linkage in *Capsicum annuum*).
Idengaku Zasshi/Jap. J. Genet. 1947 :
Suppl. 1 : 87-96. [Japanese].

Purple flowers are usually simply dominant to white, though in one case, purple and white flowers segregated in a ratio of 15 : 1. Usually, purple flowers are associated with purple unripe fruits, and white flowers with green unripe fruits, but the converse associations were also obtained by crossing. Purple style (*P*) is dominant to white style (*p*), but purple styles are also produced irrespective of *P* if the genotype *R*₁*C* or *R*₂*C* is present. *P* and *R* genes

are linked with a recombination value of 20-24%.

Plastid stability is under the control of the gene pair *V v*; *V* confers stability, while *v* results in a tendency for plastid mutation. A recombination value of ca. 15% appears to subsist between *v* and *u* (upright peduncle).

2900 VOLYNEC, O. S.

(*Camelina sativa* in the USSR).

Sovetskaja Agronomija (Soviet Agronomy) 1953 : No. 3 : 81-83. [Russian].

Various productive varieties developed in the USSR are described.

2901 FROLOV, P. V.

(The best standard varieties of winter rape).

Selekcija i Semenovodstvo (Breeding & Seed Growing) 1952 : No. 12 : 32-38. [Russian].

Some recent standards of *Brassica Napus* var. *oleifera* and one variety of *B. Rapa* var. *oleifera* are described. Vinnickii Mestnyi [Local Vinnica], which was selected from the local winter rapes, is productive and hardy and reaches maturity in June. It yields more seed than other varieties per ha. and the seed has a high oil content. The 1000 seed weight is 4.8 gm. Podoljskii Mestnyi [Local Podol], selected from local material, resembles Vinnickii Mestnyi, but is hardier and produces seed with a higher oil extraction. Dublanskii [Dubljany] is noted for the high oil content of its seed, in which it surpasses all other varieties. It is productive but susceptible to low winter temperatures. The 1000 seed weight is 5.7 gm. and it reaches maturity in July. The plants are vigorous and bear large pods. Černjahovskii Mestnyi [Local Černjahovskii] is the only *B. Rapa* form included among the new standards. It was obtained from local material by single plant selection for productiveness and hardiness. It is 9-18 days earlier than Vinnickii Mestnyi and 12-21 days than Dublanskii and yields more seed and oil per ha. than most other varieties. In some seasons it is outyielded by the less hardy variety Moldavia 2.

2902 NARAIN, A.

Bloom character in castor oil plant (*Ricinus communis* Linn.).

Curr. Sci. 1952 : 21 : 166-67.

Several subtypes of two main types, designated single bloom and double bloom, are distinguished. In the former main type bloom is present on the stem, petiole and peduncle; in the latter it also occurs on the under surface of the leaf. The subtypes are breeding true.

2903 DOMINGO, W. E.

The development of domestic castor bean production.

Econ. Bot. 1953 : 7 : 65-75.

Breeding carried out in the USA since the early 'forties is reviewed, with particular reference to the release of varieties combining high yielding capacity, earliness, growth habit suitable for mechanical harvesting, and resistance to shattering. Hybrid strains produced by utilizing partially male sterile lines are undergoing final tests.

2904 LARROQUE, P.

Action d'ensemble en vue d'une étude générale des ricins. (Concerted action with a view to a general study of castor oil plants).

Oléagineux, Paris 1953 : 8 : 125-29; 189-95.

In view of its great variation and its multitude of local races and hybrid forms, the castor oil plant must be reclassified, and for this a uniform system of description is necessary, as a preliminary to satisfactory breeding operations. Directors of several African stations of the Institut de Recherches pour les Huiles et les Oléagineux have therefore been asked to describe all the semiwild or cultivated forms occurring in their respective regions. In addition, observers and others collaborating in the survey are asked to adopt the descriptive classifications, already formulated and here set out, for stems, leaves, fruits and seeds and also to use the identifying names or numbers that will be assigned to the various forms by the laboratory of the institute.

Botanical descriptions are given of *Ricinus communis*, *R. persicus* and *R. zanzibarensis*.

2905 MAZZANI, B. & HOROVITZ, S.

Base genética del mejoramiento de *Sesamum indicum* L. de frutos indehiscentes. (Genetical basis of breeding *S. indicum* L. with indehiscent fruits).

Agron. Trop., Venezuela 1952 : 2 : 197-205.

The character indehiscent capsules conditioned by the gene *id* is accompanied by reduced fertility and a number of other unfavourable properties. Selection for increased fertility in populations containing the gene has tended to increase the degree of dehiscence, and the same effect was observed in back crosses with commercial lines. Only by parallel selection for high fertility and low dehiscence was it possible to attain a combination of the two desirable features, resulting evidently from the action of

two sets of modifiers affecting each character separately.

2906 FROLOV, P. V. & KOPTEV, G. S.

(The cultivation of sesame under irrigation).

Sovetskaja Agronomija (Soviet Agronomy) 1953 : No. 4 : 74-78. [Russian].

Soviet varieties of sesame comprise a central Asiatic and a European ecotype. The former varieties are interesting for their productiveness and high oil content and the latter for their earliness and resistance to bacterial attack. Taškent 122, developed at the Central Asiatic Research Station, proved the most productive variety when grown under irrigation. The European varieties had been bred at Krasnodar, Rostov and Odessa from material introduced from Manchuria and Siberia.

2907 NEVZOROV, V.

(An agronomist and breeder on a collective farm).

Selekcija i Semenovodstvo (Breeding & Seed Growing) 1952 : No. 12 : 66-67. [Russian].

Safedak Obi-Garmskii [White Obi-Garmskii] was selected by a Tadžik collective farmer from some local brown-seeded forms of linseed with pale blue flowers. The selected material bore white flowers and produced tall extensively branching stems bearing many capsules. The seed of the productive new variety is white and has a 3-4% higher oil content than the other linseed varieties in the Obi-Garmskii district.

2908 CRUICKSHANK, I. A. M.

Studies on the physiologic specialization of *Melampsora lini* (Ehrenb.) Lev. in New Zealand.

N.Z. J. Sci. Tech. 1952 : 34 : Sect. B : 128-33.

Twelve physiological races of *M. Lini*, each widely distributed, have been identified in collections made during 1950 and 1951 from the main flax and linseed areas. These New Zealand races cannot be correlated with races previously described in America and Australia because fewer differentials were used and greenhouse conditions were not comparable.

Resistance of linseed and linen-flax varieties to flax-rust (*Melampsora Lini*) in New Zealand. III.

N.Z. J. Sci. Tech. 1953 : 34 : Sect. A : 468-70.

Of the 69 varieties tested for reaction to a mixed inoculum of 11 races of *M. Lini* common in New

Zealand, 6 were classified as highly resistant, 10 were resistant and the remainder showed various degrees of susceptibility. Owing to the appearance of race 12 in 1950, linseed varieties Ottawa 770B, Golden Viking and Sheyenne, and the fibre varieties Stakhanovetz [Stahanovite] D-83, 806/3, Wada, Cascade and Argentine II, all previously recommended for their resistance (cf. *PBA*, Vol. XXII, Absts. 1354 and 1355), are now classed as susceptible.

- 2910 MIRAVALLE, R. J., SWENSON, S. P. & CLEARY, J. W.

Annual report on oil crops investigations.

Wash. Agric. Exp. Sta. 1952 : Pp. 20. (Mimeographed).

Sunflower. The results of a variety trial at Pullman are summarized. Mennonite and Lovaszpatona were the best all-round varieties from the standpoints of yield, oil content, maturity and height.

Safflower. Safflower varieties were compared with crambe (*Crambe abyssinica*) in yield trials at three centres. Selections of two spineless introductions and six Nebraska strains had disappointingly low oil contents, except in the case of one plant (4002-5), with a refractive index and iodine number of 1.4777 and 138.8 respectively; the origin of this plant is uncertain. Interrelationships between head diameter, spininess, oil content, hull percentage and iodine number are under investigation. Crosses between six selections to provide material for studying the inheritance of oil content and spininess, gave only three viable seeds; further crosses are to be attempted.

- 2911 DESJOBERT, G.

La culture du lin oléagineux. (The cultivation of linseed).

Bull. Tech. Ing. Serv. Agric. 1953 : No. 77 : 167-72.

The English and Canadian linseeds tested in France have proved lower yielding and less resistant to drought and diseases than the variety Morocco, a population from which some lines were isolated for trials. The variety Pervenche, bred by Plonka of the Versailles Plant Breeding Station and released in 1952, was tried in the Loiret district but did not fulfil expectations, though still regarded as worth further observation. Another promising variety is Pastel, which may surpass the Morocco population in yield of seed and straw and in earliness.

- 2912 CHAVENCY, A.

L'abrasin en Indo-Chine. (Tung in Indochina).

Agron. Trop. 1952 : 7 : 567-88.

This review deals with the history of the genus *Aleurites* as a crop plant, its systematic classification and its botanical characteristics from the morphological, physiological and biological aspects; the composition of the oil and its uses; breeding in the USA and other countries; the planting and cultivation of tung; and its prospects in Indochina.

- 2913 IGONIN, I.

(Saratov 10, a new sunflower variety).

Kolhoznoe Proizvodstvo (Collective Farming) 1952 : No. 5 : p. 59. [Russian].

Saratov 10 was bred in recent years at the Institute of Farming of the Southeastern USSR. It is a midseason variety with resistance to *Orobanche*, and is more productive and has a higher oil content than Saratov 169.

- 2914 CHEVALIER, A.

Le palmier à huile (*Elaeis*) et sa culture au Congo. [The oil palm (*Elaeis*) and its cultivation in the Congo].

Rev. Int. Bot. Appl. 1953 : 32 : No. 363-64 : 1-16.

CHEVALIER, A.

Note complémentaire sur l'*Elaeis*. (Supplementary note on *Elaeis*).

Ibid. 1953 : 32 : No. 363-64 : 16-19.

In reviewing the work that has been done in the Belgian Congo on oil palm improvement by cultivation and breeding, A. Chevalier draws largely on R. Vanderweyën's report on the subject as well as the INEAC records of research at the Yangambi Experimental Station, which are regularly reviewed in *Plant Breeding Abstracts* (cf. Vol. XXII, Abst. 2542).

Some notes on the oil palm in various countries and on contributions by different investigators to its botanical classification form a supplement to the main article.

- 2915 DUTT, M.

Note on the cytology of *Atropa acuminata* Royle ex Lindley.

Curr. Sci. 1952 : 21 : 168-70.

Meiotic studies have indicated that the chromosome number of *A. acuminata* is similar to that of other members of the genus ($2n = 72$). Among the meiotic irregularities observed, trivalent formation was the most common. Pollen production was, however, normal.

- 2916 LOVE, H. T., COWGILL, W. H. & HOPP, H.
Test of a proposed method of sampling cinchona bark for fluoro-metric analysis for quinine.
Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 279-82.

At Finca El Naranjo, Guatemala, the quinine content of 16 cinchona plantings was estimated by the standard sampling procedure and by a newly devised and less laborious method of sampling a single disc of bark only from each tree. Statistical tests for mean difference, variability, curvilinearity, and origin and slope of the regression line have shown that both methods are equally reliable. Therefore the new method will be employed for sampling large populations.

- 2917 R.R.I. '600' series.

R.R.I. Plant Bull. 1953 : New Ser. No. 7 : 72-78.

Information is given on the parentage, yield and other characteristics of the selected clones RRI 600-623, which have been tested in small-scale trials at the Rubber Research Institute, Malaya. Plantings for extensive trials of these new clones are now being established.

- 2918 BAPTIST, E. D. C.

Improvement of yields in *Hevea brasiliensis*.

World Crops 1953 : 5 : 194-98.

Yield improvements effected at the Rubber Research Institute of Malaya by selecting superior mother trees and controlling their pollination are outlined. Legitimate seedling families giving four times the yield of unselected trees have been obtained from clones of the RRI 600 series since 1937 (cf. PBA, Vol. XXII, Abst. 2943). Recent tendencies for the depressing effect of inbreeding to be seen among progenies indicate, however, that further yield increases of *Hevea brasiliensis* in the eastern hemisphere will depend on the introduction of Brazilian strains showing genetic variability.

- 2919 **Annual Reports for 1949-51 of the Pathological Division of the Rubber Research Institute of Malaya : 1953**
Pp. 50; 34; 34.

Work reported includes an analysis of inter-clonal variability in respect of the occurrence of secondary leaf fall, associated with the following parasites: *Oidium Heveae*, *Gloeosporium alborubrum*, *Hemitarsonemus latus* and *Scirtothrips dorsalis*. At Sungei Buloh, clones Avros 50 and BD 5 lost 38.5 and 39.7%, respectively, of the total leaf canopy, but only 4.4 and

4% of the canopy of Tj. 1 and Pil B 84, respectively, fell as immature leaves.

- 2920 KUDAŠEVA, R. F.

(Breeding *Euonymus verrucosa* and methods of developing highly productive plant resources for the gutta percha industry).

Trud. Inst. Lesa (Trans. Inst. For.) 1947 : No. 1 : 157-89. [Russian].

Selection for a high gutta percha content at the USSR Scientific Research Forestry Institute is reported.

FRUITS AND NUTS

- 2921 VAARAMA, A.

Marjanviljelyn edellytyksistä maasamme. **(The condition of berry cultivation in our country).**

Maatalous ja Koetoin. 1950 : 4 : 99-112.

In a review of soft fruits cultivated in Finland, brief references are made to varietal differences in yield, quality, hardiness and earliness among black currants, red currants, white currants, gooseberries, raspberries and strawberries.

- 2922 BROOKS, R. M. & OLMO, H. P.

Register of new fruit and nut varieties. List 7.

Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 497-504.

Commercial varieties recently developed in the USA and Canada are listed; a short description mentioning parentage is given for each variety (cf. PBA, Vol. XXII, Abst. 2944).

- 2923 **Annual Report of the East Malling Research Station, near Maidstone, Kent, 1st October, 1951 to 30th September, 1952 (1953) : Pp. 190.**

Rogers, W. S. *I. Pomology*. (pp. 21-26).

Woolly-aphid resistant rootstocks of apple, bred jointly by the East Malling Research Station and John Innes Horticultural Institution, have been named the Malling-Merton series (MM) and distributed for further tests in Britain and other countries.

Field and laboratory studies of frost resistance in apple and other fruit varieties continued. Scion material of the new apple Michaelmas Red (McIntosh Red x Worcester Pearmain) is available (cf. Abst. 594).

Selections of black currant from crosses between commercial varieties are under observation. Seeds and seedlings of hybrids between black currant and related *Ribes* species were treated with colchicine. Colchicine-induced tetraploids

of selfs and hybrids of black currant are also being studied. Red raspberry breeding continued.

Hoblyn, T. N. & Pearce, S. C. II. *Statistics and records*. (pp. 27-28).

Further work has been carried out on designs that will permit the addition of a new set of treatments to an existing trial, or the omission of external guards. Studies have also been made of (1) the problems arising from the analysis of a single trial where there is no possibility of confirming doubtful results; (2) the interpretation of particular treatment differences when a comprehensive test has revealed that significant differences exist between treatments; and (3) the modifications required in the analysis of variance when a systematic element arises in the design. In addition, formulae have been devised for (4) the accuracy of treatment comparisons in Latin Squares when some data are missing; and (5) for grouping a range of varieties in respect of some important characteristic, if they are too diverse to be compared in a single trial. In work on plant variation and sampling, a sounder mathematical basis for assessing tree-to-tree variation has been developed.

Harris, R. V. V. *Plant pathology*. (pp. 34-38).

Testing of hop varieties and seedlings for resistance to *Verticillium* wilt continued. A seedling of the J series (J 2) was intensively propagated; it has exhibited moderate resistance to wilt in small-scale trials and has the advantages of an exclusively English parentage, being derived from a resistant variety of the Golding type.

Tydeman, H. M. *A description and classification of the Malling-Merton and Malling XXV apple rootstocks*. (pp. 55-63).

Detailed descriptions and photographs are given of 15 Malling-Merton rootstocks and of M XXV.

Garner, R. J. *The nursery behaviour of the Malling-Merton and Malling XXV apple rootstocks*. (pp. 64-66).

The propagation qualities of M XXV and the MM series are described and compared with those of older members of the Malling series.

Modlibowska, I. & Ruxton, J. P. *Preliminary studies of spring frost resistance of black currant varieties*. (pp. 67-72).

None of the varieties studied in preliminary laboratory and field tests exhibited marked

resistance to frost, although some varieties were less damaged than others. In the laboratory, the buds were damaged more than the open flowers, the flowers of Seabrook's Black suffering less injury than those of other black currants.

Pearce, S. C., Jolly, G. M. & Freeman, G. H. *A review of experimental design at East Malling, 1948-1952*. (pp. 83-87).

Modifications of standard layouts for trials of fruit varieties are described. The special problems discussed are the design of calibration trials, the elimination of headland effects, change of treatment in long-term trials, the use of balanced designs for comparing treatments with a control, and the design of layouts for plantations that are to be subsequently thinned.

Keyworth, W. G., Hitchcock, M. M. & Goode, P. M. *Verticillium wilt of the hop. VII. Further studies on wilt-resistant varieties*. (pp. 112-19).

Investigations on resistance to wilt carried out since 1947 are surveyed. The results of primary selection tests and large-scale field trials are summarized. Year-to-year variations in the performance of resistant varieties were probably environmental and not related to differences in pathogenicity among fungus strains. In field trials, most of the selected varieties showed progressively less wilt in succeeding years. Breeding initiated in 1944 has resulted in resistant male hops valuable for further breeding, and several promising female seedlings. A variety forming an entirely satisfactory substitute for Fuggle is however still required.

Preston, A. P. *Five new apple rootstocks*. (pp. 169-70).

The woolly-aphid resistant rootstocks MM 104, MM 106, MM 109 and MM 111 show particular promise for Britain. M XXV, less resistant to woolly aphid, is also of interest, since it induces precocious and very vigorous trees.

Wilson, D. J. *Notes on some strawberry varieties*. (pp. 176-78).

The performance of eight varieties in tests at East Malling is described.

2924 NAIK, K. C.

Plant breeding in relation to tree fruits.

Indian J. Hort. 1953 : 10 : 23-25.

The need for establishing a Central Horticultural Research Institute in India is stressed, with reference to the wide range of variability among local species and the possibility of improvement by selection.

2925 VENKATARATNAM, L.

Breeding of horticultural crops with special reference to perennial fruit crops.

Indian J. Hort. 1953 : 10 : 26-31.

The progress of preliminary research to develop improved varieties of citrus, mango and banana in different Indian states is reviewed and attention is drawn to the need for coordination by means of a central organization.

2926 SLOVIĆ, D.

(A study of the principle of development of fruit trees).

God. Zborn. Zemjodel.-Šumarsk. Fak. Univ. Skopje (Ann. Rep. Fac. Agric. For. Univ. Skopje) 1951 : 3 : 175-99. [Serbian].

A simple formula for determining longevity of fruit trees and nuts, based on growth ratios of the roots and stems in the first year of development, is presented.

2927 CHINOY, J. J.

Grafting as an aid to breeding of fruit trees.

Indian J. Hort. 1953 : 10 : 37-41.

Literature concerning the influence of rootstock on hybrid seedlings used as scions is reviewed, with particular reference to the work of Mićurin.

2928 HILKENBÄUMER, F.

Das Verhalten von Kernobst- und Pflaumenunterlagen unter verschiedenen Standortverhältnissen während der Zeit des Ertragsanstieges. (**The behaviour of pome fruit and plum rootstocks under different conditions of locality during the period of increasing yields**).

Z. Pflanzenz. 1953 : 32 : 79-106.

The behaviour of grafts of various apple, pear, quince and plum varieties on a number of recognized rootstocks and certain seedling stocks is reported from observations in the 12th to 15th year.

2929 GOLUBINSJKIĬ, I. M.

(The effect of volatile substances emanating from flowers upon the growth of pollen grains in angiosperms).

Bot. Ž. (Bot. J.), Kiiv 1951 : 7 : No. 4 : 61-66. [Ukrainian].

Pollen growth of various plants, including pome and stone fruits and black currant, was intensified in artificial media to which petals or whole flowers of the same species had been added.

2930 THOMAS, P. H.

Apple varieties raised in Tasmania.

Tasm. J. Agric. 1953 : 24 : 8-10.

A description is given of Legana, selected from a cross between Democrat and Delicious by a private breeder. It is a deep red, very late keeping apple, similar in flavour to Delicious.

2931 CHEVALIER, A.

D'où viennent les pommiers à bons fruits de nos jardins et de nos vergers? (**Whence come the dessert apples of our gardens and orchards?**)

CR Acad. Sci. Paris 1952 : 234 : 2126-28.

A note is presented on the history of French dessert apple varieties, especially those of Normandy.

2932 ELLENWOOD, C. W.

Many apple varieties on trial.

Fm. Home Res. 1953 : 38 : p. 69.

An account is given of the testing of apple varieties at the Ohio Agricultural Experiment Station. Prominent among varieties used in breeding are McIntosh, Jonathan, Delicious and Rome Beauty.

2933 KEMMER, E.

Über das primäre und das fertile Stadium bei Apfelgehölzen. (**The primary and the fertile stage in apple trees**).

Züchter 1953 : 23 : 122-27.

Experiments are reported in which, by various treatments such as grafting, ringing and nutritional adjustments, mature fruits have been obtained from the early tissues previously supposed to belong to the juvenile zone, and conversely leaves of the juvenile type from mature trees.

2934 KOČETOV, S. P.

(Leaf metamorphosis and the production of vegetative fruits in the apple).

Sad i Ogorod (Fruit & Vegetable Gardens) 1953 : No. 2 : p. 78. [Russian].

The development of abnormal fruits from vegetative tissues in London Pippin, Simirenko's Reinette and Tiroljka [Tyrolian] was observed in the Krasnodar territory and the Rostov province. The principal forms of anomalies are described. Some fruits of London Pippin incorporated reproductive and vegetative tissues. They had a diameter of 5.5 cm and contained empty loculi.

2935 CARLONE, R.

La mela "Runsé." (**The apple Runsé**). Ital. Agric. 1953 : 90 : 206-16.

This popular variety in certain regions of the Piedmont zone of Italy is described. It is

vigorous and bears bright red fruits which, though they are juicy and sweet as soon as they are picked, keep well until the middle of May.

2936 KLEIN, L. G.

Apples for processing. New varieties show promise.

Fm Res. 1953 : 6 : No. 2 : p. 8.

LA BELLE, R.

Apples for processing. Processing quality in apples.

Ibid. 1953 : 8 : No. 2 : p. 9.

Information is given on the flavour, yield, colour and firmness of several varieties when processed as slices. Monroe (Rome Beauty x Jonathan) and Webster (Ben Davis x Jonathan), developed by the New York State Agricultural Experiment Station, and introduced in 1949 and 1938, respectively, meet the requirements of both grower and processor.

2937 BISHOP, C. J.

Apple varieties, old and new. Eighty-eighth Annual Report of the Nova Scotia Fruit Growers' Association, 1951 : 99-102.

Breeding at the Experimental Station, Kentville, NS, is described. In hybridization to develop scab-resistant apples, use has been made of a highly resistant large-fruited crab, Geneva Crab. The value of X irradiation as a means of inducing sectorial sports with improved fruit colour is being explored.

2938 OLDÉN, E. J.

Sexual and apomictic seed formation in *Malus Sieboldii* Rehd.

Bot. Notiser 1953 : No. 1 : 105-28.

At the Balsgård Fruit Breeding Institute, Fjälkestad, Sweden, triploid, pentaploid, tetraploid and hexaploid progenies, obtained by pollinating two *M. Sieboldii* tetraploids ($2n = 68$) with pollen from other tetraploid and diploid varieties and species of *Malus*, indicated that the fusion of both reduced and unreduced ♀ and ♂ gametes had occurred. All ♂ gametes produced by tetraploid *M. Sieboldii* were diploid. Apomictic tetraploid offspring were obtained from both tetraploids after the stimulation of pollen from *Pyrus* and *Taraxacum*. Similarly, since the tetraploid progeny resulting from crosses between *M. Sieboldii* and the red-leaved *M. Eleyi* ($2n = 34$) were all green-leaved, it is assumed that pseudogamy had given rise to apomictic strains. One diploid ($2n = 34$) arising from *M. Sieboldii* x *M. Eleyi* is considered to be a diplohaploid.

Mixoploids with somatic chromosome complements varying between 63 and 102 occurred when *M. Sieboldii* was pollinated by such cultivated tetraploids as 37/60 and 260/38.

Comparisons made between progenies showed that triploids are most vigorous. Tetraploids and their apomictic offspring possess a high degree of resistance to *Venturia inaequalis*, and defoliation occurs two weeks earlier than in their hybrid progenies. Pentaploids were characterized by larger flowers, pollen grains and fruits than their tetraploid parents.

2939 CRANE, M. B. & MARKS, E.

Pear-apple hybrids.

Nature, Lond. 1952 : 170 : p. 1017.

Pear-apple hybrids have been produced from crosses of the pear Fertility with an unnamed tetraploid apple and the diploid apple variety Crawley Beauty at the John Innes Horticultural Institution. The pear ovaries were treated with β -naphthoxy-acetic acid after emasculation and again after pollination. The hybrid seedlings developed intermediate characters and had somewhat defective root development; eleven have however survived. One seedling from each cross was examined cytologically; the seedling from pear x tetraploid apple was triploid, that from pear x diploid apple was diploid.

2940 MARKS, G. E.

Genetical studies in pears. VI. Giant bud sports.

J. Hort. Sci. 1953 : 28 : 141-44.

Two large-fruited bud sports, Improved Fertility and Double Williams', previously assumed to be tetraploids on the basis of the chromosome complements of pollen mother cells, are shown to be periclinal chimeras. Each has a diploid epidermis, while all other tissues are tetraploid. It is suggested that all somatic sports arising from normal buds of tree fruits are probably periclinal chimeras, since it is unlikely that identical gene mutations or changes in chromosome complement would occur in each of the initial cells from which normal buds develop.

2941 KAZI-ZADE, F. N.

(Pears with four fruiting periods in a year).

Priroda (Nature) 1952 : No. 11 : 122-23. [Russian].

In Azerbaidžan, several pear trees of the variety Williams were observed to flower in June, July and August, besides flowering at the normal time in April. The flowers borne in August, and the resultant fruits, were deformed.

- 2942 CARPENTER, T. R. & SHAY, J. R.
The differentiation of fireblight resistant seedlings within progenies of interspecific crosses of pear.
 Phytopathology 1953 : 43 : 156-62.
 A new method of inoculating young seedlings in the greenhouse by spraying shoot apices under pressure with inoculum plus an abrasive has been devised at Purdue University, Lafayette, Ind. Seedlings from controlled and uncontrolled crosses involving *Pyrus ussuriensis*, *P. serotina* and *P. communis* gave differential reaction to *Erwinia amylovora* after the 8-leaf stage. A higher percentage of susceptible plants was eliminated by inoculation between the 8-leaf and 24-leaf stages in the greenhouse than was eliminated from similar progenies inoculated with a hypodermic syringe during the first three seasons of growth in the nursery.
- 2943 MILBRATH, J. A.
Selecting stone fruit trees free from virus diseases.
 Sta. Bull. Ore. Agric. Exp. Sta. 1952 : No. 522 : Pp. 27.
 Procedures devised at the Oregon Agricultural Experiment Station for selecting trees free from some 20 viruses known to occur in local orchards are outlined, in connexion with the establishment of virus-free stands for breeding and scion production. Desirable selections of sweet and sour cherry varieties recommended to local growers are listed.
- 2944 COCHRAN, L. C. & STOUT, G. L.
Apricot ring pox.
 Bull. Calif. Dep. Agric. 1953 : 42 : 7-10.
 A detailed account of this disease mentions the differential reaction of commercial varieties to ring pox virus infection. In inoculation tests in southern California, only Royal remained symptomless; Hemskirke was less severely affected than other commonly grown varieties.
- 2945 TUPICYN, D. I.
(Plums in Uzbekistan).
 Sad i Ogorod (Fruit & Vegetable Gardens) 1953 : No. 5 : 11-13. [Russian].
 Local forms and introduced varieties cultivated in the zone of the Main Turkmenian Canal are briefly surveyed. The former are susceptible to cold and produce fruits of indifferent flavour, but Renklod Zelenyi [Green Gage], Burton, Burbank and Ispolinskaja [Giant] which have been introduced from other districts are productive and hardy and bear good quality fruits. The most promising varieties have been bred recently in central Asia at the Institute of Plant

Industry from *Prunus salicina* and myrobalan. The new plums, of which Arka [Arch], Leto [Summer] and Puncovaja [Purple] are named, come into bearing early and are interesting for their high yield and the good quality of their products.

- 2946 KÜPPERS, H. & FRIEDRICH, G.
 Auslese von Pflaumenformen der Gattung *Prunus domestica* (L.) für die Samengewinnung und Anzucht von Pflaumen-Veredelungsunterlagen. [**Selection of plum forms of the genus *P. domestica* (L.) for seed production and raising of plum rootstocks**].
 Züchter 1953 : 23 : 127-34.

Vigorous rootstocks which give strong growth equal to that of the myrobalan but are hardier are required for German plum orchards, and observations were made on the seedlings of a number of plum varieties; those from two French plums, Damas Blanc [White Damson] and St. Julien d'Orléans, were promising and a population of 30,000 seedlings was raised for breeding purposes. Some selections have proved relatively uniform in their seed progeny and information is given on the type of tree they produce, when allowed to grow unmolested and when grafted with three standard varieties. The most promising are being subjected to further observation under orchard conditions.

- 2947 SCHMIDT, M.
 Beiträge zur Züchtungsforschung bei Kirschen. I. Phaenologische und pomologische Untersuchungen an Süßkirschensämlingen. (**Contributions to breeding research with cherries. I. Phenological and pomological investigations on sweet cherry seedlings**).
 Züchter 1953 : 23 : 97-115.

Many seedlings from the cross Flamentiner x Früheste der Mark proved to be as early as the latter parent, which is the earliest cherry in Germany, but surpassed it in flavour, juiciness and firmness of flesh. Data are presented concerning some of these seedlings and a number of German cherry varieties in respect of beginning and end of flowering and the effect of weather conditions upon them, date of leaf emergence, rate of swelling and colouring of the fruit, and the date and duration of the ripening period. The period from flowering to ripening was different in different seedlings, so that the dates of the two were not always correlated. Seedling 13 was early in both flowering and maturity,

and often ripened even before Früheste der Mark.

Data are also given of size, shape and weight of fruit, length of peduncle, colour and consistency of skin and flesh, size and form of stone, and flavour of fruit in the seedlings, and the varieties with which their pollen is fertile are indicated. Seedling 9 gave the highest yield and seedling 7 had the best combination of earliness, fruit quality and yield.

- 2948 BYLDA, A. Z.
(Growing cherries in the Altaï territory).

Sad i Ogorod (Fruit & Vegetable Gardens) 1953 : No. 2 : 33-36. [Russian].

Cherry breeding at the Altaï Horticultural Research Station and at its Čemaljskii Branch is mentioned. Two promising seedlings of *Prunus Besseyi*, Krupnoplodnaja [Large-fruited] and Sladkoplodnaja [Sweet-fruited], have been selected.

- 2949 LESLEY, J. W. & BONNER, J.
The development of normal peach seedlings from seeds of early-maturing varieties.

Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 238-42.

By picking the early-maturing fruits of Robin and Florence a few days before maturity and storing them at 2°C for 7 weeks, the characteristic dissolution of the embryo, resulting in a low percentage seed viability, was prevented. It should therefore be possible to use very early varieties as seed parents, provided cold storage is available before embryo culture.

- 2950 KUCERJAVYH, E. G. & KOSTJUK, M. D.
(Supplying plants with nutrients other than through their roots is a powerful method of directing changes).

Lesnoe Hozjaistvo (Forestry) 1952 : No. 5 : 23-29. [Russian].

The appearance, size and flavour of the fruits of a fourth generation seedling of the peach Elberta were improved when nutrients were injected into the stem. Stones from the fruits of the improved peach gave, with one exception, trees bearing good quality fruits.

- 2951 RODIONOV, A. P.
[Vegetative hybrids between the peach and apricot (Nectarines obtained experimentally)].

Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1953 : No. 1 : 36-45. [Russian].

At the Ukrainian Horticultural Institute a

peach trained first on one apricot stock and then on another produced apparently normal peach fruits. However, the first generation seedlings showed variability in respect of their fruit characters. Five seedlings bore nectarines, 8 bore normal peaches and 17 fruits of intermediate character between the peach and nectarine, with a flavour superior to that of the former. The material remained constant when grafted on various stocks.

- 2952 CULAJA, V. I.
(Lemon varieties for cultivation in trenches).

Sad i Ogorod (Fruit & Vegetable Gardens) 1953 : No. 4 : 29-32. [Russian].

Breeding the Meyer lemon for improved quality of fruit at the Institute of Arid Subtropics is mentioned. Meanwhile, it retains pride of place over other varieties grown in trenches in central Asia, because of its high yield, early bearing and other good economic properties. Of the other varieties, Villa Franca, Lisbon and Lunaria are interesting for their regular bearing and Amalfi and Vernija for their resistance to drought.

- 2953 NAURIYAL, J. P.
Self-incompatibility in pumelo (*Citrus maxima* Merr.).

Curr. Sci. 1952 : 21 : p. 347.

In experiments at the Fruit Research Station, Saharanpur, United Provinces, the pomelo Chakaiya was found to be self incompatible.

- 2954 VITUŠKINA, I. V.
(Pollination of the lemon with lily pollen).

Agrobiologija (Agrobiology) 1953 : No. 1 : p. 109. [Russian].

A lemon, cultivated indoors, produced a few normal ripe fruits when pollinated with the pollen of a lily.

- 2955 ISLAM, A. S.
A preliminary report on the colchicine-induced tetraploids of *Anona squamosa* L.

Curr. Sci. 1953 : 22 : 118-20.

The chromosome number of *A. squamosa* was found to be $2n = 14$. Treatment of germinating seeds with 0.2% colchicine solution for 7 hours at 28°C resulted in tetraploid plants ($2n = 28$), which flowered earlier than the diploid controls. Treatment of the shoot tips of young seedlings with a 0.2% solution for 6 hours induced polyploids and a polyploid chimera, recognized by stomatal characters and the size of the internal tissue of the leaf.

2956 MUKHERJEE, S. K.

The mango—its botany, cultivation, uses and future improvement, especially as observed in India.

Econ. Bot. 1953 : 7 : 130-62.

This survey includes sections on the following: the origin and distribution of the mango; the genus *Mangifera*; floral biology; fruit development and polyembryony; cytogenetics and breeding; classification of varieties; and problems of future improvement of the mango by breeding and other means.

2957 ŠČEPOTJEV, F. L.

(Metaxenia of the walnut).

Agrobiologija (Agrobiology) 1953 : No. 1 : 110-12. [Russian].

At Kirovograd, Ukraine, paternal inheritance in respect of fruit shape was observed in the walnuts Šiškovatyj [Cone] and Mindalevidnyi [Almond] when pollinated with the pollen of *Juglans mandshurica*. The patroclinous fruits borne on Šiškovatyj weighed 2.6 g. more than normal fruits and 3.8 g. more than those of the pollen-bearing parent. The patroclinous fruits of Mindalevidnyi were also larger than the normal fruits of this variety or those of *J. mandshurica*.

2958 HYUN, S.

(The serological affinities of trees pertaining to the genera *Quercus* and *Castanea*).

Kyushu Daigaku Nogaku Enshurin Hokoku/Bull. Kyushu For. 1949 : No. 17 : 1-87. [Japanese].

A serological classification, coinciding in general with the usual taxonomic arrangement, has been drawn up for a series of *Quercus* species and for 9 cultivated varieties of *C. crenata*, the wild form of this species, the Chinese chestnut, and the indigenous Korean chestnut.

2959 SCHAD, C., SOLIGNAT, G., GREUTE, J. & VENOT, P.

Recherches sur le châtaignier à la Station de Brive. (Research on the chestnut at the Brive Station).

Ann. Inst. Nat. Rech. Agron., Paris 1952 : 2 : Sér. B : 369-458.

A fuller account is here given of the research reviewed in Abst. 636.

2960 SERR, E. F. & KESTER, D. E.

New almond variety released.

Calif. Agric. 1953 : 7 : No. 6 : p. 5.

Davey, a new almond variety selected from an F_1 cross between Nonpareil and Sans Faute, has been released. It shows good tree growth,

yield and nut characteristics, and is immune to bud failure, crazy top and mule tail. Besides meeting the need for a good pollinator for Nonpareil, it is cross fertilizable with Jordano, Ne Plus Ultra, Peerless and Texas-Mission.

2961 CRESCIMANNO, F. G.

Contributo allo studio di alcune varietà di mandorlo coltivate in Sicilia. (Contribution to the study of certain almond varieties grown in Sicily).

Riv. Ortoflorofruttic. Ital. 1953 : 37 : 71-81.

Descriptions and illustrations are given of ten of the most widely cultivated almond varieties in Sicily, of which three are indicated as being of particular interest, namely Insalaca and Sancisuca (Sanguisuca) with semihard shells, and Casteltermini with soft shells.

2962 Annales du Centre de Recherches Agronomiques de Bambey au Sénégal. Année 1949. (Annals for 1949 of the Agricultural Research Centre of Bambey, Senegal).

Bull. Agron. Fr. d'Out. Mer. 1951 : No. 5 : Pp. 60.

Details are given of groundnut cultivation, the best varieties for the different areas, and new hybrids evolved. The production of groundnuts is continuing to increase as the result of improvements in varieties. In tests, the two new runner varieties, 47-16 and 47-11, gave good results, whilst 42-94, 31-33, 36-65, 24-11 and 29-70 also showed all-round superiority to other varieties tested. Among the erect varieties 37-13, 28-207, 41-48, 37-59 and 28-2-6 gave the best results.

2963 STOREY, W. B., HAMILTON, R. A., NAKASONE, H. Y.

Groff—a new variety of lychee.

Circ. Hawaii Agric. Exp. Sta. 1953 : No. 39 : Pp. 8.

The new variety, Groff, is a seedling from the Chinese variety Hak Ip. It is distinguished by its superior yield and quality of fruit. The great majority of the seeds do not mature, with the result that the proportion of edible flesh is greater.

2964 MENEZES, O. B. DE

Do sexo e sua "reversão" em *Carica Papaya*. (Sex and its "reversion" in *C. Papaya*).

Rev. Agric., S. Paulo 1953 : 28 : 1-12.

Seeds taken from a female tree pollinated by a male gave a proportion of 9 female: 11 male seedlings. No reversion to female was observed

in the male trees when they were cut back after flowering and induced to flower again three times. The only effect observed was a slight enlargement of the rudimentary pistil present in the male flowers but no true fruits were produced.

2965 SINGH, R. N.

Prospects of papaya (*Carica papaya* L.) breeding in India.

Indian J. Hort. 1953 : 10 : 32-36.

Trials for evaluating the adaptability of approximately 100 introductions from various tropical and subtropical countries are in progress at the Saharanpur Fruit Research Station, Uttar Pradesh. Selections already showing promise for breeding to develop varieties suitable for papain production and dessert and culinary purposes are listed. On the basis of results of genetical studies on sex inheritance, some 40 crosses were made between female and hermaphrodite plants from which equal ratios of both parent types capable of bearing fruits are expected.

Colchicine treatment of seedlings of Puerto Rico 47248 has produced two female and two male tetraploids with $n = 18$. Pollen from the latter proved to be sterile, but the females have been crossed with diploid males of the same variety.

2966 ANDERSON, E.

Variation in avocados at the Rodiles Plantation.

Ceiba, Tegucigalpa 1950 : 1 : 50-55.

A correlation diagram is given for petiole length, lamina breadth, lamina length, basal angle of lamina, leaf odour and colour of the lower surface of the leaf for the extensive series of avocado varieties maintained at the Rodiles Plantation near Atlitxco, Mexico. The results suggest that the varieties may have been derived from two ancestral types, (1) a form with small leaves, glaucous beneath and smelling strongly of anise, and (2) a large-leaved type, green beneath, odourless, and with a comparatively short petiole. The correlation between the leaf characters is, however, not strong, and this fact, together with the exceptions to the correlations noted, may mean that more than two ancestral species are involved.

2967 SRINIVASAN, V. K.

Chromosome numbers in the genus *Zizyphus*.

Curr. Sci. 1952 : 21 : 224-25.

The following haploid numbers are reported for trees growing in the neighbourhood of Surat, Bombay State: *Z. rotundifolia*, 36; *Z. oenophlia*

and *Z. Mauritiana*, 24; *Z. Jujuba*, 24, 36 or 48. Secondary association of bivalents was observed in all samples. In *Z. rotundifolia* and *Z. Mauritiana* meiosis was normal; in *Z. oenophlia*, laggards resulted in the formation of micronuclei. In *Z. Jujuba* trees with $n = 24$ or 36, meiosis was regular. In 4 out of the 6 trees with $n = 48$, meiosis was irregular, most of the pollen showing degeneration and polymorphism.

2968 PROKOFEV, S. D.

(For high yields of small bush fruits).

Sad i Ogorod (Fruit & Vegetable Gardens) 1953 : No. 4 : 9-13. [Russian].

Results of varietal trials at the Moscow Research Breeding Station in the last five years are reported. Latham proved the most productive raspberry and Severnaja Zvezda [Polar Star] the best red currant variety. Lija Plodorodnaja [Prolific Lia] has beaten all other black currants in yield. The small-fruited gooseberry Carry outyielded all other varieties, including the large-fruited Angliiskii Želtyi [English Yellow]. Komsomolka headed the list of strawberries, with Obiljnaja [Abundant] as a close runner-up.

2969 **Yellow raspberry developed.**

What's New Crops Soils 1953 : 5 : No. 8 : p. 29.

Goldenwest yellow raspberry has been released for the home garden by the Washington State College Experiment Station, Puyallup, Wash.

2970 OBERLE, G. D. & MOORE, R. C.

Transmission of the autumn-fruiting character in crosses of red and black raspberries.

Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 235-37.

An analysis of the autumn fruiting capacity of progenies of red raspberry crosses made at Blacksburg, Va., has shown that Durham, Indian Summer, September, St. Regis and Sunrise transmit this characteristic. Large numbers of seedlings giving fruit crops in the autumn were produced by Indian Summer x Durham and Indian Summer x September. About 50% of the purple-fruited progenies obtained by crossing two black varieties, Bristol and Cumberland, with the red varieties Durham, September and Indian Summer also gave autumn crops.

2971 KANÉR, R.

Om tolkning av *Rubus pruinus* Arrh. (On the interpretation of *R. pruinus* Arrh.).

Bot. Notiser 1953 : No. 2 : 233-35.

The author believes *R. pruinus* to be a hybrid

series formed by the crossing of *R. caesius* x *R. Idaeus* with any one of the following species: *R. nemorosus*, *R. ciliatus*, *R. tiliaceus*, *R. Wahlbergii* or *R. ambifarius*.

Brief descriptive notes are given on the five triple hybrids, with, when known, their chromosome numbers as determined by Å. Gustafsson. The cross *R. caesius* x *R. Idaeus* gives a very low set of fruit, but, when crossed with a third species, fertility is good and, in the rare triple hybrid with *R. Wahlbergii*, even very good.

2972 CHRISTEN, H. R.

Die Embryologie von *Rubus idaeus* und von Bastarden zwischen *Rubus caesius* und *Rubus idaeus*. (The embryology of *R. idaeus* and of hybrids between *R. caesius* and *R. idaeus*).

Z. indukt. Abstamm.- u. VererbLehre 1953 : 84 : 454-61.

Examinations of three hybrids showed them all to have the somatic chromosome number $2n = 21$; all varieties of *R. Idaeus* examined had $2n = 14$ and displayed regular meiosis and embryo-sac development, similar to that already observed in the sexual species *R. tomentosus* (cf. *PBA*, Vol. XXII, Abst. 2231). The early archesporium development of the hybrids was also normal, but certain irregularities such as undifferentiated nucelli were observed later, and at meiosis 9 bivalents and 1 trivalent were often present, together with certain other irregularities. The majority of embryo sacs were reduced but occasional diplosporous embryo sacs occurred and only these seemed to be functional. The tendency to diplospory has evidently been transmitted to the hybrids from *R. caesius* and seems to be only partially recessive to the gene *D* for sexuality.

2973 DRAIN, B. D.

Some inheritance data with black raspberries.

Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 231-34.

Tabulated data are presented concerning seedling progenies derived from the following crosses made under greenhouse conditions at Knoxville, Tenn.: Bristol x Black Beauty; Bristol x Honey Sweet; Logan x Bristol and the reciprocal; Cumberland x Logan; and Bristol x Cumberland and the reciprocal. A number of selections with desirable large-sized glossy black fruits of good flavour are being propagated, although plant characters are on the whole unsatisfactory. None has shown resistance to leaf blight

(*Fabraea maculata*), a major factor in Tennessee. Interspecific crosses are being effected in the hope of securing superior hybrids.

2974 JOHANSSON, E. & BERGELIN, E.
Sortförsök med krusbär. (Variety trials with gooseberries).

Medd. Trädgårdsförs. 1953 : No. 77 : Pp. 20.

During 1942-51 variety trials were carried out at different places in Sweden. The present report deals with 10 trials over different periods of years.

Yields varied according to locality. The hardest varieties were American Mountain gooseberry, Scania, Champion, Triumphant and Industry. Whitesmith, which was graded as fairly hardy, held its own as regards yield and quality in most of the trials.

The suitability of different varieties for various parts of Sweden is indicated.

A list of 34 varieties, including a few Swedish, has been compiled from Swedish sources and shows the colour, size and quality of the fruits of many of the varieties included in the above trials.

2975 DARROW, G. M., SCOTT, D. H. & GALLETTA, G. J.

New blueberry varieties for New Jersey.

Bull. N.J. Agric. Exp. Sta. 1952 : No. 767 : Pp. 8.

Additional information is given on the new blueberry varieties Earliblue, Bluecrop, Herbert (cf. Abst. 2193) and Ivanhoe (cf. *PBA*, Vol. XXII, Abst. 2240).

2976 HYLMÖ, B.

Gammal jordgubbe med nytt namn. (An old strawberry with a new name).

Fruktodlaren 1953 : No. 1 : 21-22.

The author again (cf. Abst. 2195) advances evidence in support of his contention that the strawberries Eklatant and Mannevik are identical. Though it seems likely that Missionär [Missionary] is a third synonym, it is suggested that the clone Missionär should retain that name for the time being.

2977 HILL, R. G. (JUN.)

Red stele resistant strawberry varieties for Ohio.

Proc. Ohio Hort. Soc. 1953 : 106 : 190-203.

Trials of red-core resistant varieties during 1951

and 1952 at the Ohio Agricultural Experiment Station are reported. Red Crop (cf. *PBA*, Vol. XXII, Abst. 1435) and Fairland gave the best results.

- 2978 SIMMONDS, N. W.
Segregations in some diploid bananas.
J. Genet. 1953 : 51 : 458-69.

The results from crosses between seeded and edible diploid forms of *Musa acuminata* indicate that several dominant genes are involved in parthenocarpy, some of these genes occurring in the wild, seeded bananas. Persistence of bracts and flowers on the male axis of the bunch is probably controlled by complementary genes which can only achieve expression in the presence of the genetical background of parthenocarpy. It is suggested that pleiotropy is responsible for the association of parthenocarpy and persistence, and that the two characters have a common physiological control by growth substances. Data from the cross between the Selangor and Tavoy forms of *M. acuminata* were indicative of wide genetical and cytological differentiation between the two races. The F_2 of the interspecific cross between *M. ornata* and *M. velutina* contained many vigorous and fertile segregates, thus demonstrating the absence of any major reproductive isolation between the two species.

The evolution of parthenocarpy in the edible diploids is discussed. Parthenocarpy in Pisang Lilan depends upon three dominant genes, subject to the action of modifiers. Two, P_2 and P_3 , are also known to occur in the wild seeded diploids. The third, P_1 , has so far only been found in Pisang Lilan, and it is therefore described as a "switch" gene, since it alone has the power to bring about parthenocarpy in a system of wild dominants. It is assumed that the gene owes its dominance to the effect of human selection. The following stages in the evolution of parthenocarpy in the edible diploids are proposed: (1) the accumulation of a complex of dominants from wild bananas; (2) the evolution of a dominant switch locus; and (3) the accumulation of genes for sterility and of modifiers of parthenocarpy. This process would have given rise to primitive edible diploids, whose evolution would then have proceeded by interbreeding and by back crossing as male parents to the wild bananas of the neighbouring forests. Male sterility in the advanced edible diploids would be developed as the result of chromosomal interchange and other structural hybridity. The evidence available so far suggests that

parthenocarpy in *Musa acuminata* originated in Malaya.

- 2979 ANGULO CARPIO, M. D.
 Nota sobre la cariólogía de dos especies del género "*Opuntia*." (**Note on the caryology of two species of the genus *Opuntia*.**)
Genet. Iber. 1952 : 4 : 47-57.

Meiotic studies on *O. Ficus-indica* and *O. Dillenii* from the Spanish province of Almería showed the former species to be an octoploid with $2n = 88$ and considerable meiotic irregularities, and the latter a hexaploid with $2n = 66$ and more regular meiosis. The former species at least is considered to be of hybrid origin, and it is suggested that certain valuable features found in some of the individuals occurring in the south of Spain, such as large fruits and relative freedom from spines, could be further improved by selection and hybridization.

- 2980 MELHUS, I. E. & SMITH, F. O.
The Mayan husk tomato . . . a tropical fruit comes to Iowa.
Iowa Fm Sci. 1953 : 7 : 211-12.

The Mayan husk tomato (*Physalis pubescens*) of Guatemala is being introduced in Iowa and the midwestern states. The numerous selections tested show wide variability in time of maturity, photoperiodic requirements and in sepal development; only a few have exhibited adaptability to conditions in the United States.

- 2981 HUSFELD, B.
 Aussichten auf Qualitätsreben bei der Resistenzzüchtung. (**Prospects of producing quality grapes in breeding disease resistant strains.**)
Dtsch. Weinb. 1952 : 19 : 1-2.

The question of breeding new strains, resistant to disease and producing a high quality wine, is discussed. In experiments a number of new European white-wine hybrids were shown to be superior in yield and quality to the control variety Silvaner, and details are given of backcrossing to produce resistant varieties whilst still retaining the quality of the established varieties.

Experiments showed that quality is inheritable from the wild grape parents as well as from the European parents. Backcrossing can eliminate the alien taste of the wild varieties, which masks their good qualities. Many of the new resistant crosses are superior in quality to the established European varieties with which they were compared and are free from alien flavours.

2982 KIBALOV, P. I.

(Prospects for the development of viticulture in the zone of the North Crimean Canal).

Vinodelië Vinogradarstvo SSSR (Wine-making Viticult. USSR) 1953 : No. 3 : 9-12. [Russian].

Mention is made of new early dessert varieties of vines, Magarač 352 and Magarač 372, bred at the Magarač Institute. The former was obtained from Muskat Fioletovyi [Mauve Muscat] x Halili Belyi [White Halili] and the latter from Madeleine Angevine x Šuvargany.

2983 ALMEIDA, J. L. F. DE

Advance note on the production of polyploids in *Vitis vinifera* L.

Agron. Lusit. 1952 : 14 : 173-74.

Triploid and tetraploid forms of Portuguese varieties have been obtained from inflorescences subjected to heat shocks at temperatures of 30-45°C for periods of 10-30 minutes.

2984 DOBROVOLJSKIĬ, A. N.

(The selection of a medium for germinating vine pollen).

Agrobiologija (Agrobiology) 1953 : No. 1 : 67-75. [Russian].

Some nutrient solutions, in which the pollen of *Vitis vinifera* (Pinot Franc), Amurskiĭ Oboepolyi [Amur Perfect Flower], Riparia, Rupestris, *Ampelopsis brevipeduncula* and *Parthenocissus quinquefolia* showed good growth and development, are described.

2985 RODRIGUES, A.

Um método filométrico de caracterização ampelográfica. Fundamentos—descrição—técnica operatória. (A phyllometric method of ampelographic determination. Bases, description and technique of operation).

Minist. Econ. Direc. Serv. Agríc. 1952 : Pp. 42.

A system of measuring the characteristics of vine leaves according to the position of the tips and the angles of the main lobes, together with certain other features, is described. An arithmometer is supplied by means of which the actual measurements can be converted into those corresponding to a leaf with a central vein of 100 mm. length. The data can thus be measured directly from the leaf and used to constitute a typical leaf for each variety.

2986 SNYDER, E. & HARMON, F. N.

Grape breeding summary 1923-1951.
Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 243-46.

A general survey is given of breeding carried out

at the US Horticultural Field Station, Fresno, Calif. Most of the work has been directed towards the production of seedless table grapes; in this connexion the release of Cardinal, Calmeria and Blackrose is mentioned (cf. *PBA*, Vol. XX, Abst. 2627 and Vol. XXII, Abst. 1441). The selection of nematode resistant rootstocks from open-pollinated Dog Ridge, Salt Creek and Solonis x Othello 1613 is nearing completion.

2987 DURQUETY, M. & BISSON, J.

Etude ampélographique des sarments de certains cépages français du Sud-ouest. (An ampelographical study of the stocks of some French vines of the southwest).

Montpellier Pp. 11.

Descriptions are given of a series of French vines, the following features being used as diagnostic characters: colour of the sarmentum, striping of the internodes and relative size and colour of the nodes, cross-sectional diameter of the sarmentum and thickness of the medulla.

2988 BARRETT, H. C.

Black rot resistance in grapes.

Diss. Abstr. 1953 : 13 : Publ. No. 4413 : 2-3.

In experiments at the University of Illinois, large-scale inoculation of plants in the greenhouse was found to be a satisfactory means of evaluating resistance to black rot, provided inoculum derived from natural sources was used. *Vitis cinerea*, *V. rupestris* and *V. Champini* were the most resistant among the ten species examined in the wild state or under cultivation. In general, F₁ progenies from 78 crosses involving 54 clones were intermediate in resistance, compared with their parents, but showed considerable variation in this character.

2989 ARTOZOUL, J.

Notes ampélographiques sur la série 12.000 Seyve-Villard. (Ampelographical notes on the Seyve-Villard series 12000).

Progr. Agric. Vitic. 1953 : 70 : 355-58.

The author gives a number of characteristics by which the 18 different commercial varieties of this vine may be distinguished from each other.

FORESTRY

2990 **Thirty-third Annual Report of the Forestry Commissioners for the year ended September 30th 1952 (1953) :**
Pp. 90.

A brief review of research in the United Kingdom refers to the continuation of the survey of seed

stands, selection of plus individuals for breeding, and a study of cross pollination of numerous forest trees.

2991 MATTHEWS, J. D.

Forest tree breeding in Britain.

Z. Forstgen. Forstpflanzenz. 1953 : 2 : 59-65.

Favourable conditions for the application of genetics to forestry in Britain are outlined, with emphasis on the available species and strains of diverse origin. A brief historical survey of the development of provenance and genetical studies culminates in a review of current research organized by the Forestry Commission, referring especially to the survey of seed stands and selection of plus trees, on the basis of clonal and progeny trials, for future breeding of oak, beech, larch, pine and spruce (cf. Abst. 1485).

2992 BUCHHOLZ, E.

Neuere sowjetische Arbeiten über Forstpflanzenzüchtung und forstliche Samenkunde. (**Recent Soviet works on forest tree breeding and seed production**).

Z. Forstgen. Forstpflanzenz. 1953 : 2 : 65-70.

A review of Soviet literature on the subject is presented.

2993 WRIGHT, J. W.

A survey of forest genetics research.
J. For. 1953 : 51 : 330-33.

Geographical races and interspecific and intra-specific hybridization in the USA are surveyed, with special reference to the importance of selecting seed trees of good quality and the advisability of using local races or others known to be suitable for particular localities. Among the improved strains particularly mentioned are a blister-rust resistant white pine hybrid and the hybrid between Japanese and European larch; both exhibit hybrid vigour.

2994 ARNBORG, T. & HADDERS, G.

The Society for Practical Forest Improvement.

Svenska SkogsvFören. Tidskr. 1953 : 51 : 173-82.

An account is given of the work of the Society for Practical Forest Improvement, organized in Sweden during 1941 by forest companies. Its activities include: (1) selection of plus trees, their vegetative propagation and the establishment of plantations for seed production; (2) classification of forests with respect to their

value for seed collection, as a means of obtaining the best possible seed until the full realization of programme (1); and (3) trials of introduced conifers.

2995 KRAHL-URBAN, J.

Hinweise auf individuelle Erbanlagen bei Eichen und Buchen. (**Indications of individual hereditary constitution in oak and beech**).

Z. Forstgen. Forstpflanzenz. 1953 : 2 : 51-59.

Studies of certain oak and beech woods of which unbroken records are available since the year 1587 show that individual trees vary in flushing time and the time they shed their leaves in autumn, and the two are not correlated. Progenies of individuals that came into leaf late contained a markedly higher proportion of late types than progenies of individuals coming into leaf early, in both beech (*Fagus sylvatica*) and oak (*Quercus Robur* and *Q. sessiliflora*). Examination of stands that had been renewed exclusively by natural regeneration showed strong resemblances between adjacent trees in respect of such characters as crown and branch form, upright trunk and forking, indicating the hereditary nature of these characters; there are indications that the same also applies to spiral grain.

2996 JOHNSON, H.

Hybridaspens ungdomsutveckling och ett försök till framtidsprognos. (**Juvenile development of the hybrid aspen and an attempt to assess its future**). Svenska SkogsvFören. Tidskr. 1953 : 51 : 73-96.

Using the increment records to date at the 8-year old experimental plantations of hybrid aspens at Ekebo and Myckinge in Sweden (cf. PBA, Vol. XXI, Absts. 667 and 3035), the author assesses the productivity of *Populus tremuloides* ($2n = 19$) x *P. tremula* ($2n = 19$), as compared with that of other diploid and triploid hybrids of aspen. He attributes the more rapid development of *P. tremuloides* x *P. tremula* to heterosis and disease resistance and also to the fact that the North American parent came from more southerly latitudes, as compared with Scandinavia, so that the pure *P. tremuloides* offspring were stimulated by the transfer to the more northerly environment at Myckinge. In its chemical constituents the hybrid closely resembles the spruce, which it could equal in timber production under good conditions in southern Sweden.

2997 SEITZ, F. W.

Über anomale Zwitterblüten eines Klones der Gattung *Populus*, Sektion *Leuce*. (**On anomalous hermaphrodite flowers in a clone of the genus *Populus*, section *Leuce***).

Z. Forstgen. Forstpflanzenz. 1953 : 2 : 77-90.

In continuation of earlier investigations (cf. *PBA*, Vol. XXII, Abst. 3013 and Vol. XXIII, Abst. 1486) embryological and cytological studies were made of a hermaphrodite white poplar clone. The chromosome number was normal ($2n = 38$). Approximately one third of the flowers of a given catkin were hermaphrodite, and the remainder female. In meiosis the male elements were slightly ahead of the female. The clone appeared to be relatively infertile, many pollen cells and ovaries showing arrested development. After self pollination some ovaries were not penetrated by the pollen tubes. The appearance of hermaphrodites in the Salicaceae is, in general, attributed to hybridization. The clone under investigation was thought to be a natural hybrid of *P. tremula*, *P. alba* and *P. canescens*.

Hermaphroditism in the clone described is thought to be brought about by a breakdown of the normal mode of interaction between the sexual realizer combination and the gene complex responsible for bisexual potentiality.

2998 BERGER, W.

Studien zur Systematik und Geschichte der Gattung *Carpinus*. (**Studies on the systematics and history of the genus *Carpinus***).

Bot. Notiser 1953 : No. 1 : 1-47.

A monographic survey is presented on the systematics and distribution of existing and fossil members of the genus *Carpinus*. It is noteworthy that, in Tertiary times, many forms occurred in Europe that are restricted today to eastern Asia. Five new species are described from the Lower Pliocene deposits of the Viennese Basin, namely, *C. vindobonensis*, *C. Kisserei*, *C. Zabuschi*, *C. Knolli* and *C. Polzeræ*. All these species come within the circle of forms centring around *C. Tschonoskii*.

2999 PENFOLD, A. R. & WILLIS, J. E.

Physiological forms of *Eucalyptus citriodora* Hooker.

Nature, Lond. 1953 : 171 : 883-84.

The occurrence of a physiological form in which citronellal was largely replaced by citronellol and its esters has been already reported (cf. Abst. 2222). The open-pollinated progeny of

this tree fall into four groups for oil composition: (1) the normal aldehyde type, with 65-85% aldehyde content; (2) an alcohol ester group, similar to the parent tree; (3) a hydrocarbon type; and (4) a group intermediate between (1) and (2). Two forms corresponding to groups (3) and (4) and additional trees of type (2) have been found growing close to the original variant. The progeny of the alcohol-ester form of *Leptospermum citratum* shows a similar variability in oil composition (cf. *PBA*, Vol. XXI, Abst. 1267).

3000 GLOBA-MIHAILENKO, D. A.

(**Hardy *Eucalyptus* trees**).

Priroda (Nature) 1953 : No. 3 : 117-18. [Russian].

Some material, hardy under Tuapse conditions, was obtained by Mičurinite training.

3001 TESDORFF, H.

Vorläufige Mitteilung über Kreuzungsversuche mit *Araucaria*. (**Preliminary communication on crossing experiments with *Araucaria***).

Z. Forstgen. Forstpflanzenz. 1953 : 2 : p. 90.

Crosses were made in Argentina between *A. araucana* and *A. angustifolia* in 1951-52 in an attempt to produce a hybrid with the superior wood quality of the former and the quicker rate of growth of the latter. Seed is expected to mature in 1953 and 1954.

3002 ZOBEL, B.

Geographic range and intraspecific variation of Coulter pine.

Madrõno, S. Francisco 1953 : 12 : 1-7.

Analyses of 9 isolated stands of *Pinus Coulteri* in California showed that little intraspecific differentiation had occurred. The stand near Idria, San Benito Co., however, was distinguished by its smaller cones and may represent an incipient geographical race.

3003 McMILLAN, C.

Variation in seedlings of *Cupressus Abramsiana* Wolf.

Madrõno, S. Francisco 1953 : 12 : 28-30.

Variation in germination rate and cotyledon number between three samples of *C. Abramsiana* is reported which fits in with the supposition that this species is of hybrid origin.

3004 SUGIHARA, Y.

(**Studies on the chromosome numbers of the gymnosperms**).

Idengaku Zasshi/Jap. J. Genet. 1947 : Suppl. 1 : 132-38. [Japanese].

A synopsis is presented of determinations of

chromosome numbers in the gymnosperms by recent investigators.

- 3005 AGEEV, A. & LENSKIĬ, M. A.
(**Breeding and introducing *Sequoia* to the Black Sea Littoral of the Caucasus**).

Lesnoe Hozjaistvo (Forestry) 1952 : No. 6 : 78-79. [Russian].

At Soči, artificial hybridization has given more viable seed than open pollination and the progeny so obtained proved more vigorous. An improved method of vegetative reproduction was developed at the USSR Forestry Institute.

- 3006 SCHRÖCK, O. & STERN, K.
Prüfung des Wachstumsganges der Kiefer im Keimlingstest als Auslesemethode. (**Examining the course of growth in pines in seedling tests as a method of selection**).
Züchter 1953 : 23 : 137-48.

Growth increments when calculated as a percentage of an end value and plotted on arithmetic probability paper give a straight line. A nomogram is presented whereby the values can be calculated without plotting.

Figures are given which suggest that the growth figures in the first 21 days of seedling development are correlated with seed weight and with the performance of the 16-year old trees.

- 3007 LANGNER, W.
Eine Mendelspaltung bei *Aurea*-Formen von *Picea Abies* (L.) Karst. als Mittel zur Klärung der Befruchtungsverhältnisse im Walde. [**Mendelian segregation in aurea forms of *P. Abies* (L.) Karst. as a means of establishing the fertilization relationships in a forest**].
Z. Forstgen. Forstpflanzenz. 1953 : 2 : 49-51.

Seed taken from cones of green trees growing in the vicinity of a group of 9 *aurea* trees produced less than 20% of yellow seedlings when the seed parents were 25 m. away from the *aurea* trees, well under 10% when they were 40 m. away, and at a distance of 40-70 m. 10 trees had 0-1%, 16 had 1-5%, 1 had 5.1% and 1 had 10.8%. Less than 1% of yellow seedlings occurred in progenies of trees at distances of 70 m., 100 m. and over. The proportions of yellow seedlings were considerably less than the above in progenies of green trees growing around single *aurea* trees. It is clear that pollination is effected mainly from trees standing in immediate proximity.

- 3008 FISCHER, F.
Beobachtungen an der Nachkommen-schaft einer dickrindigen (lärchen-rindigen) Fichte (*Picea Abies* [L.] Karst. *lusus corticata* Schr.). (**Observations on the progeny of a spruce with a thick or "larch type" of bark [*P. Abies* (L.) Karst. *lusus corticata* Schr.]**).

Mitt. Schweiz. Zent. Anst. forstl. Versuchsw. 1953 : 29 : 7-16.

One of the oldest examples of a single-tree progeny test—in this case of a spruce sport with a thickened cortex—is recorded. The seed was sown in 1907. The experiment shows the progress that might be achieved by selection from individual trees with economically valuable characteristics. The progeny of the single tree, as compared with the mixed progenies from the various trees of the same stand (cf. *PBA*, Vol. XX, Abst. 1940), showed throughout less variability in total height.

- 3009 KIELLANDER, C. L.
Kontinentgran. (**The Continent spruce**).
Skogen 1953 : 40 : 46*-48*.

The Continent spruce [Kontinentgran] is the author's proposed designation for the central European spruce. The name "Continent" was chosen as being a shorter word than "Continental" and also free from its association with extremes of climate. In view of the superior yield and hardness of this spruce progeny trials were begun in Sweden (cf. Abst. 692) and a future breeding programme is to include inter-varietal and interspecific hybridizations. Some polyploids have also been produced whose breeding value will be tested.

- 3010 LANGLET, O.
Vad skall vi kalla "Kontinentgranen" och "Kontinenttallen"? (**What shall we call the "Continent spruce" and the "Continent pine"?**)
Skogen 1953 : 40 : p. 150.

Kiellander's proposal of the name "Continent" spruce (cf. Abst. 3009) is rejected and the suggestion is made that "Central European" should be used where a collective designation is required for the so-called German spruce or pine.

- 3011 KIELLANDER, C. L.
Kontinentgranen. (**The Continent spruce**).
Svenska SkogsvFören. Tidskr. 1953 : 51 : 130-47.

The main substance of this paper on the Continent spruce (cf. Abst. 3009) has already been

reviewed from other sources (cf. *PBA*, Vol. XXII, Absts. 771 and 774). Research on tetraploid spruces obtained by colchicine treatment is in progress and the possible value of triploids that might be bred from them is mentioned.

3012 BINGHAM, R. T., SQUILLACE, A. E. & DUFFIELD, J. W.

Breeding blister-rust-resistant western white pine.

J. For. 1953 : 51 : 163-68.

Numerous rust-free individuals have been selected from stands of western white pine (*Pinus monticola*) subjected to natural infection with *Cronartium ribicola* in the Inland Empire region of Idaho since 1949. Those whose apparent resistance was confirmed by exposing young grafts to conditions of artificial infection have been crossed in all possible combinations. F₁ progeny trials for rust reaction are in progress at Spokane, Wash. Selfed seedlings are also being reared to study the inheritance of rust resistance and possible degeneration following inbreeding. Since the resistant selections represent a considerable range in latitude and altitude, racial variations in respect of growth rate and timber quality are under investigation.

Hybridization has been attempted for the first time between rust-resistant *P. monticola* and certain Eurasian white pines known to carry factors for rust resistance. Seedlings were obtained from the following crosses: *P. monticola* x *P. Griffithii*, *P. monticola* x *P. koraiensis* and *P. monticola* x *P. Peuce*.

In order to discover whether more than one race of *C. ribicola* exists in North America, grafts from the four most promising *P. monticola* selections were sent for trial in various parts of the USA and Canada in 1951. Pollen and F₁ seed have also been distributed.

VEGETABLES

3013 **Third Annual Report of the National Vegetable Research Station, Wellesbourne 1952 (1953) : Pp. 50.**

The section by J. C. Haigh on plant breeding reports that the extent of crossing between Brussels sprouts varieties when planted in alternate rows is being investigated. The degree of isolation necessary for seed production in thousand-headed kale, red cabbage, savoy and kohlrabi is being determined. A study of the variability and synonymy in commercial varieties of spring cabbage, cabbage lettuce and red beet has been initiated. An inbreeding programme for brassica crops is planned.

3014 BASSE, R.-R. H.

Kurze Beschreibung der neu zugelassenen Gemüsesorten. (**A short description of new approved vegetable varieties**). Saatgutwirtschaft, Stuttgart 1953 : 5 : 65-66.

Varieties of the following crops have been passed for seed production by the German Committee for Approval of Horticultural Economic Plants: dwarf and climbing beans, peas, lettuce, spinach, radish, celery, Savoy cabbage, kohlrabi, onion and yellow turnip. The breeder's name and the genetic origin and main characteristics, including disease resistance, of the varieties are briefly noted.

3015 HINTZE, S.

Sortförsök med köksväxter i södra och mellersta Sverige 1939-1944. Frilandsgurka, lök, morot, purjo, rödbeta, sallat, selleri, spenat och frilandstomat. (**Variety trials with vegetables in southern and central Sweden, 1939-44. Outdoor cucumber, onion, carrot, leek, garden beet, lettuce, celery, spinach and outdoor tomatoes**).

Medd. Trädgårdsförs. Malmö 1952 : No. 72 : Pp. 54.

A detailed account is given of the performance of varieties and strains of the above mentioned crops in trials at Alnarp and at other research centres in Sweden (cf. *PBA*, Vol. XIX, Abst. 554).

Yields and quality are recorded, and, in the case of lettuce and beet, also any tendency to bolting. The assortment tested comprised varieties from other countries as well as Sweden.

3016 LAMM, R., TOMETORP, G. & ÅVALL, H. Klassificerande sort- och stamförsök med köksväxter 1949-1951. (**Classifying variety and strain trials with vegetables 1949-51**).

Medd. Trädgårdsförs. Malmö 1952 : No. 73 : Pp. 30.

New approved varieties and strains of beans, lettuce, cucumber, cauliflower, carrots and garden beet mainly representing the work of Swedish breeders are described with details of their performance in various localities in Sweden, their origin and the name of the firms by which they were bred. The four new varieties mentioned are:—

Nimbus/51, a stringless, green podded, dwarf bean from the cross Olsok x Hundra för en [Hundred-for-one]; it surpasses the latter variety

in yield and earliness and has dark green slender pods about $4\frac{1}{2}$ inches long.

Ahle/51 and Beka/51, both high yielding, brown seeded, shelling beans, the former being a selection from a land variety, and the latter a Dutch variety introduced by a Swedish seed firm. Ahle/51 is earlier than Beka/51 and has small seeds, but the latter is of better quality. Ivea/51, an outdoor lettuce with a large, curly, crisp head; it is similar to Hanson and the names may be synonyms. The flavour is good and the heads retain their quality well.

3017 LARSSON, G.

Sortförsök med köksväxter i Norrland. VII. Sockerärter, rödbetor och vitkål 1949-1951. (**Variety trials with vegetables in Norrland. VII. Sugar peas, red beets and white cabbage, 1949-51**).

Medd. Trädgårdsförs. Malmö 1953 : No. 76 : Pp. 66.

These trials, conducted at Alnarp and at 20 different places in Norrland, included 19 varieties of sugar peas, five of garden beet and four of white cabbage (cf. *PBA*, Vol. XXII, Absts. 1559 and 1560).

The peas Signal/47 and Pollux/47, with the dwarf varieties Symbol OE/47, receive favourable mention for earliness and yield. Reform/47 (cf. *PBA*, Vol. XIX, Abst. 2205) was the highest yielding of the dwarf varieties.

The beet Egyptisk plattrund W:s/51 [Egyptian turnip rooted W:s/51] is regarded in general as having outyielded the other varieties, but Crosby almost equals it in yield and surpasses it in quality.

The white cabbage Ruhm von Enkhuizen gave the highest yield on the average, while Ditmarsker was the earliest and also produced a fairly good crop in the northern and most extreme districts of Norrland.

3018 SHAH, G. L.

Chromosome number in four umbellifers.

Curr. Sci. 1953 : 22 : 50-51.

The following haploid numbers are reported: *Apium graveolens*, *Pimpinella adscendens*, 11; *Daucus carota* and *Carum copticum*, 9.

3019 NOHE, E.

Zur Samengewinnung von Beerenfrüchten bei Züchtungsarbeiten. (**On obtaining seeds from berry fruits in breeding operations**).

Saatgutwirtschaft, Stuttgart 1953 : 5 : 36-37.

A new method of obtaining seed from single

plants of berry fruits has been devised, though not yet tested in practice.

The seeds taken from tomatoes, cucumbers or potatoes are smeared on a strip of paper 10×50 sq. cm. in size. After 30-90 minutes when the slimy coating of the seeds has set, the strip is put in a room with a draught for 1-2 days until the seeds are completely dry, when they can be scraped off or left adhering until required for sowing.

A modification whereby the seeds still adhering to the paper could be planted direct in the seed box is also suggested.

3020 SVENSSON, V.

Weibulls Kardinal Original (= Vertou W:s/51). [**Weibull's Kardinal (= Vertou W:s/51)**].

Weibulls Allehanda 1953 : No. 1 : 9-12.

This new fast-growing, deep red carrot, bred at the Plant Breeding Institute Weibullsholm, Sweden, is intended primarily for the cold frame, but can be grown in the open on good soil in southern Sweden and for summer use in Norrland. Derived by pedigree selection from an aberrant type of Juvel [Jewel], it is smooth, long and tapering with a blunt tip and a small core almost completely red or orange coloured. It is easily lifted.

At Weibullsholm its average yield for six years in the cold frame was 8.6% more than Amsterdam and 18.5% more than Nantes. Sown in autumn, it can be used for pickling.

3021 OLESEN, O. J.

Improved carrot varieties.

Fmg in S. Afr. 1953 : 28 : p. 54.

By a programme of selection at the Pretoria Horticultural Research Station, an improved strain of Cape Market has been obtained. It incorporates a smaller core, greater uniformity of colour and shape, and less tendency to bolt than the original variety, but possesses the same high yielding capacity, adaptability and early maturity. A superior type of Chantenay has also been selected.

3022 YAMAGUCHI, M., ROBINSON, B. & MACGILLIVRAY, J. H.

Some horticultural aspects of the food value of carrots.

Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 351-58.

Analyses have shown the influence of variety on the composition of carrots grown at San Jose, Calif. Imperator had a higher content of dry matter, calcium, phosphorus and total sugars, starches and proteins than other varieties

tested; Nantes had a very low vitamin A content.

3023 LAMB, K. P.

Observations on yield and varietal susceptibility of some carrot varieties to insect attack in the field.

N.Z. J. Sci. Tech. 1953 : 34 : Sect. A : 531-37.

Data are given on the yield, mean plant weight and reaction to aphid (*Cavariella aegopodii*) and rust fly (*Psila rosae*) of six varieties tested in New Zealand. Osborn Park gave the highest yield and was the least damaged by aphid, but suffered the heaviest infestation of rust fly. Manchester Table showed the least infestation by rust fly but the most damage due to aphids. Chantenay, Early Horn and James Intermediate were moderately attacked by both pests. In Osborn Park, the densities and single leaf counts of aphids were lowest; this variety may therefore possess some degree of resistance.

3024 NILSSON, F. & HINTZE, S.

Sort- och stamförsök med morötter 1948-1950. (Variety and strain trials with carrots, 1948-50).

Medd. Trädgårdsförs. 1952 : No. 75 : Pp. 32.

Trials in seven different localities throughout Sweden were carried out on Regulus W:s/44, Flakkeer OE/44, Amager Tagenshus III, Nantes strains OE/48 and W:s/43, and London torg strains LD/45 and W:s/45. Differences in yield, root quality, sugar and carotene contents and keeping quality are recorded for the different varieties and districts.

Amager Tagenshus III had the highest content of both sugar and carotene.

Amager OE/45 and Regulus W:s/44 kept best; and Amager Tagenshus III and the two Nantes strains showed the greatest losses due to storage. A correlation was found between the contents of sugar and carotene.

3025 BANGA, O. & KEULS, M.

Praktijkproeven zomerwortelen Amsterdamse Bak 1949-1950. I. Verslag van de proef-resultaten bij Amsterdamse Bak. II. Toelichting op de wiskundige verwerking. (Trials of the Amsterdam Bak carrot 1949-50. I. Report on the experimental results with Amsterdam Bak. II. Explanation of the statistical operations).

Meded. Inst. Vered. TuinbGewass. 1952 : No. 37 : Pp. 33.

Out of 67 selections of Amsterdam Bak submitted by authorized Dutch vegetable seed

producers for judging, 29 were approved. Their growth rate, shape of root and other characteristics are recorded. On the recommendation of the judges, three types were established for the variety on the basis of root shape: the conical, intermediate and cylindrical.

3026 BANGA, O. & KEULS, M.

Praktijkproeven zomerwortelen 1949-1950. I. Verslag van de proefresultaten bij zomerwortelen. II. Toelichting op de wiskundige bewerkingen. (Trials of summer carrots 1949-50. I. Report on the experimental results with summer carrots. II. Explanation of the statistical operations).

Meded. Inst. Vered. TuinbGewass. 1952 : No. 38 : Pp. 20.

In these trials carried out in the Netherlands, the characteristics of about 20 selections, including some belonging to the varieties Slanke Nantes [Slender Nantes] and Vertou, were recorded with special reference to the shape and colour of the roots.

3027 SHIMOTOMAI, N., TANAKA, A. & NARITA, G.

(Comparative studies of diploids and artificially induced tetraploids of *Raphanus sativus* L.).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : 21-22. (Abst.). [Japanese].

In this comparative study of diploid and tetraploid strains of a Japanese variety, it was noted that the tetraploids were bulkier, though their water-absorbing capacity and transpiration rate were less, than the diploids. The osmotic pressure of the diploids was higher in the early stages of development but later the diploid value sank beneath the tetraploid.

3028 HOSODA, T.

(On the tendency to resemble the mother plant in respect of bolting in some F_1 intervarietal hybrids of the radish).

Utsunomiya Daigaku Nogaku Bu Gakujutsu Hokoku/Bull. Coll. Agric. Utsunomiya Univ. 1951 : 1 : 179-84. [Japanese].

Reciprocal differences in bolting tendency were not evident in F_1 hybrids sown in early autumn or late spring. Under colder conditions, however, the hybrids usually resembled the female parent more closely than the male in respect of bolting, except in the cross Tokinashi ♀ x Hatsuka [Twenty Days] ♂, in which the hybrid bolted like the male parent.

3029 HAGIYA, K.

(Studies on the problems of seed production in the Tokinashi radish in home and outlying districts. III. On the mechanism by which fasciation appears, and its selective action upon the degeneration of the variety). Ikushugaku Zasshi/Japan. J. Breeding 1952 : 1 : 215-18. [Japanese].

Fasciation appears to be genetically connected with delayed bolting; it results in lower seed production than in normal plants. It is therefore probable that the deterioration of the variety Tokinashi in southern Japan can be ascribed in part to the greater seed production of the nonfasciated plants, which bolt more readily than the types with a tendency towards fasciation.

3030 TATEBE, T.

(On the behaviour of incompatible pollen on the style of the Japanese wild radish).

Idengaku Zasshi/Jap. J. Genet. 1947 : Suppl. 1 : 97-99. [Japanese].

This paper is the full version of that already summarized in *PBA*, Vol. XXII, Abst. 1486.

3031 KRICKL, M.

Genügen die derzeitigen Werteigenschaften der Radieschen? (Are the present-day market qualities of radishes adequate?).

Saatgutwirtschaft, Stuttgart 1953 : 5 : 63-64.

The advances made in breeding better radishes for the Austrian market are outlined, with special emphasis on the importance of types that do not become spongy or do so only at a late stage (cf. *PBA*, Vol. XXI, Abst. 1385). This requirement is largely met by the Austrian radish, Roter Riese v. Aspern. On subjecting a pink segregate from this variety to selection, the F_3 generation proved completely free from spongy radishes from 15 May to 4 June. Subsequent selection with pulling prolonged until mid-August showed that the percentage of spongy roots had been greatly reduced. Complete elimination of the defect is neither possible nor necessary.

Selection of nonbolting plants was simultaneously carried out with success.

Breeders and growers should test potential seed plants for sponginess by examining a small pyramidal portion cut from the side of the radish.

3032 HAGIYA, K.

(Physiological studies on the manifestation of pithy tissue in root crops. II. On varietal differences in the characters concerned with the occurrence of pithy tissue in radishes).

Engeigaku Kai Zasshi/J. Hort. Ass. Japan 1952 : 21 : 165-73. [Japanese].

Studies on varietal differences in pithiness in Japanese radishes are reported. Pithiness is associated with rapid root growth, an early decline in the leaf/root ratio, a lower starch content and less soluble matter. The distribution of pithy tissue also differs according to the variety. Varieties such as Tokinashi, in which infrequent pithiness is associated with rapid root growth and high assimilative rate by the leaves, are recommended for breeding for absence of pithiness.

3033 GAUTHERET, R. J.

Recherches anatomiques sur la culture des tissus de rhizomes de topinambour et d'hybrides de soleil et de topinambour.

(Anatomical investigations on the culture of tissues of rhizomes of the artichoke and of hybrids of sunflower and artichoke).

Rev. Gén. Bot. 1953 : 60 : 129-73; 193-238.

In this anatomical and histogenetic study, the effects of growth substances and inhibitors upon rhizome tissue of *Helianthus tuberosus* and, incidentally, of its hybrid with *H. annuus* were examined. The tissues of the cross proved highly sensitive to indole acetic acid and their cells tended to multiply more actively than the cells of the parent species.

3034 JONES, H. A.

Hybrid onions.

Gdnrs' Chron. 1952 : 132 : p. 94.

An account is given of the history of the development of F_1 hybrid onions in the United States and of their performance; hybrids are gradually replacing the old standard varieties.

3035 KENNERLY, A. B.

Sensational! Is the word for Granex.

Sth. Seedsman 1953 : 16 : No. 6 : 22-23.

Although the yellow onion hybrid Granex (Texas Grano x Excel), recently released by the Texas Agricultural Experiment Station, has given outstanding yields in southern Texas (cf. Abst. 1520), the market preference for white onions has stimulated further breeding. Three white hybrids, provisionally numbered L-281, L-303 and L-365, have shown commercial

promise in the Lower Rio Grande Valley. Two additional yellow hybrids, L-36 and YB Prr, performed well in tests.

- 3036 VAN BEEKOM, C. W. C.
Uien en sjalotten. (Onions and shallots).
Meded. TuinVoorlDienst 1952 : No. 49 : Pp. 132.

In this thesis, besides an historical introduction, sections are included dealing with the economic importance of the crop, the formation of the Netherlands Onion Federation which co-ordinates research on onions and shallots, manuring, cultivation experiments, pests and diseases, storage, the choice of varieties, taste and its chemical basis, and breeding technique. Resistance to *Peronospora Schleideni* and *Botrytis Allii* is of importance in breeding new varieties. In Holland progress in onion breeding has been largely achieved by negative and positive mass selection. Research on heterosis is recommended in view of the advances made in the USA by this method (cf. *PBA*, Vol. XV, Abst. 766).

The main types and characteristics of the available assortment of Dutch varieties are shown in tables.

A subject and author index and a bibliography of 130 references complete the thesis.

- 3037 PERLASCA, G.
El comportamiento de la variedad de cebolla "Sweet Spanish" en condiciones de día corto. (The behaviour of the onion variety Sweet Spanish under conditions of short day).

Agron. Trop., Venezuela 1952 : 2 : 211-14.
Seed of this onion variety imported from the USA and sown in Venezuela gave rise to only 0.9% of plants which formed normal onions, the rest behaving like typical long-day plants and growing more like leeks. The 0.9% of short-day segregates are thought to be promising material for breeding a tropical onion with the resistance to *Phoma terrestris*, *Peronospora* and yellow dwarf characteristic of Sweet Spanish.

- 3038 JACKSON, A. A.
Better asparagus. Notes on recent research.

Quart. Rev. R. Agric. Soc. 1953 : 11-12.
Characteristics of the young shoots and mature fern constituting criteria for the selection of breeding lines at Wye, Kent, are discussed. While seedlings from crosses made in 1951 are undergoing evaluation, their parents are being propagated for large scale seed production.

Although females give higher average yields than males during the first two seasons, males produce more spears per plant in subsequent seasons and live longer. Differences reported elsewhere in respect of the weight of individual male and female spears have not been recorded at Wye, possibly because the original stocks of both sexes were selected for uniformity.

- 3039 BALDINI, E.
Ricerche sulla biologia florale del cardo. (Researches on the floral biology of the cardoon).
Riv. Ortoflorofruttic. Ital. 1953 : 37 : 10-19.

Details are given concerning the systematics and floral biology of *Cynara cardunculus* var. *altilis*. Observations by the author show that the plant is primarily cross-pollinated and very heterozygous, some seedlings suggesting the existence of outpollination with the artichoke. Some suggestions for improvement by selection are presented.

- 3040 DIKSHIT, N. N. & SINGH, U. P.
Vernalization of cabbage seeds (*Brassica oleracea* var. *capitata*).
Curr. Sci. 1952 : 21 : 249-50.

Vernalization of the early drum-headed variety Pocha at 32°F for 4 weeks resulted in the production of seed 213 days after transplantation in experiments at Saharanpur, United Provinces. No self sterility was observed.

- 3041 NORTH, C. & SQUIBBS, F. L.
The frequency of occurrence of "off type" plants in seed stocks of some *Brassica oleracea* varieties. An estimation based on the inspection of market crops in the field.
J. Nat. Inst. Agric. Bot. 1952 : 6 : 180-90.

Hybridization between different forms of *B. oleracea* accounted for only a small proportion, 6-11%, of the variants observed in several English counties. The fact that the majority of aberrant individuals showed only slight variation from the normal emphasizes the importance of selection for maintenance of the purity of varieties.

- 3042 SNEEP, J.
Praktijkproeven met Westlandse Boerenkool 1949-'50 en 1950-'51. (Trials with Westland curly kale 1949-50 and 1950-51).
Meded. Inst. Vered. TuinbGewass. 1952 : No. 42 : Pp. 26.

The merits and defects of 24 samples of different provenance of Westland curly kale, raised by

Dutch growers, are recorded, with tables showing the yield, winter hardiness, colour and degree of curliness of the leaves and breadth of the plant. Tallness appeared to be correlated with the coarser type of curliness and shortness with the finer type of curliness, which was often associated with light green leaves. The coarse type was positively correlated with winter hardiness.

The judging committee recommended the establishment of two new designations: (1) the Westlandse Herfst [Westland Autumn] group to include the finer types; and (2) the Westlandse Winter [Westland Winter] comprising the coarser types. The seven selections ultimately recommended by the judges included five belonging to the former group and two belonging to the latter.

3043 NORTH, C.

Experiments with root cuttings of Brussels sprout.

Ann. Appl. Biol. 1953 : 40 : 250-61.

An improved technique for propagating Brussels sprouts by means of root cuttings is described (cf. *PBA*, Vol. XXII, Abst. 2291). The method is suitable for the maintenance and improvement of seed stocks and for experimental work. Individual plants have been found to differ in their capacity to form buds on root cuttings; this difference is maintained by the clones derived from them.

3044 FINCH, C. G.

Variety trials of brussels sprouts 1946/47 to 1951/52.

J. Nat. Inst. Agric. Bot. 1952 : 6 : 161-79.

Results of trials carried out to compare the merits of commercial varieties and Cambridge selections, show that in most parts of England, Cambridge 1 was only equalled by Masterman in yield of first grade sprouts.

3045 TABUSE, Z.

(Observations on meiosis and the pollen grains of artificially induced tetraploid spinach).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : p. 22. (Abst.). [Japanese].

Meiosis in colchicine-induced tetraploid spinach is described. There are usually 12 or 11 bivalents, with occasional univalents, trivalents or quadrivalents.

3046 POOLE, C. F.

Lettuce improvement in Hawaii.

Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 397-400.

Kaala, a superior selection from the F_6 of Manoa x Great Lakes, is the first summer-heading

variety released by the Hawaii Agricultural Experiment Station. It is tolerant of *Rhizoctonia* bottom rot and more resistant to tipburn than Manoa.

3047 YAMAGUCHI, M., ZINK, F. W. & SPURR, A. R.

Cracked stem of celery.

Calif. Agric. 1953 : 7 : No. 5 : p. 12.

Summer Pascal and Utah 52-70 remained free from this disorder during fertilizer trials in California in 1952, but Utah 10-B was very susceptible (cf. Abst. 1539).

3048 MAKAROVSKIĖ, A. F.

(Achievements in breeding melons and gourds at the Birjučii Kut Breeding Station).

Selekcija i Semenovodstvo (Breeding & Seed Growing) 1952 : No. 11 : 32-37. [Russian].

Melon. Hybrid 150 from Kolhoznicia [Collective Farmer] x Amerikanka [American] is a midseason variety yielding 126.7 c. per ha. The fruits weigh 1-2 kg. and their consistency and flavour and keeping properties are good. Hybrid 176 from Zimovka [Winter] x Original'naja 46 [Original 46] is a late large-fruited variety with good quality fruits. The best families of this hybrid yield over 150 c. per ha. **Water melon.** Donskoĭ 39 [Don 39] from Ažinovskii 5 x Bogaevskaja Muraška [Bogaev Ant] is a productive early variety with large fruits, whose quality surpasses that of Ljubimec Hutora Pjatigorskaja 286 [Favourite of the Pjatigorsk Estate 286]. The most productive families yield 240 c. per ha. The transportability is good. Birjučekutskii 42 [Birjučii Kut 42] from Zvonok [Bell] x Melitopol'skii 142 [Melitopolj 142] is a productive late variety, notable for good quality and keeping properties of its fruits.

Pumpkin. Hybrid 27, from Birjučekutskaja 655 x Mozoleevskaja 49, Volgo-Don 18 [Volga-Don 18], from Volžskaja Seraja [Grey Volga] x Belaja Medovaja 611 [White Honey 611] and Pobeditelj Volgo-Donskoĭ 82 [Volga-Don Victor 82], from Volžskaja Seraja x Pozdnespelka [Late Maturing] are productive early types with fruits of good quality.

3049 BATRA, S.

Interspecific hybridization in the genus *Cucumis*.

Sci. & Cult. 1953 : 18 : 445-46.

In the cross *C. sativus* ♀ x *C. Melo* ♂ at the diploid level, no fruits were set. Fourteen reciprocal crosses between colchicine-induced

tetraploids of the two species resulted in the set of five fruits, of which four contained only empty seeds. Seeds in the remaining fruit, from the cross cucumber ♀ x melon ♂, gave rise to parthenogenetic diploid cucumbers.

3050 POSJAVIN, A. T.

(High yields of water melons and melons in the Penza province).

Sad i Ogorod (Fruit & Vegetable Gardens) 1953 : No. 4 : 39-42. [Russian].

Kolhoznica 749-753 [Collective Farmer 749-753], Altaï and Gribovskaja Gruntovaja [Outdoor Gribovo] gave a good account of themselves in recent trials of melons in the Penza province. The water melon Skvirskaja Skorospelka [Early Season Skvir], tested at the Petrovskaja Breeding Station for the first time in 1952, outstripped in yield the previous standards Pobeditelj 395 [Victor 395] and Ljubimec Hutora Pjatigorskaja [Favourite of the Pjatigorsk Estate].

3051 WHITAKER, T. W. & BOHN, G. W.

Natural cross pollination in muskmelon.

Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 391-96.

A yellow-green mutant with recessive genes, *yy*, determining chlorophyll deficiency (cf. *PBA*, Vol. XXII, Abst. 3044), has been used successfully to estimate the degree of natural cross pollination in *Cucumis Melo* at La Jolla, Calif. The number of offspring with normal green foliage produced by yellow-green mutants surrounded by plants of a normal green variety provides a measure of the contamination likely to occur. Cross pollination is more frequent in sheltered plots than in plots exposed to wind; this difference may be correlated with the preference of honey bees for sheltered conditions. Since flowers borne early in the season show the lowest percentage of contamination, it is suggested that only early maturing fruits should be used for breeding purposes.

3052 TRÁČENKO, F. A.

(Intervarietal cross pollination of water melon).

Agrobiologija (Agrobiology) 1953 : No. 1 : 106-109. [Russian].

Skorospelka Harjkovskaja [Harjkov Early] x Skorospelka Skvirskaja [Skvir Early], Skorospelka Skvirskaja x Ljubimec Hutora Pjatigorskaja [Favourite of the Pjatigorsk Estate], and direct and reciprocal crosses between Stokes and Skorospelka Skvirskaja outstripped all other F_1 hybrids in yield at Merefa, Ukraine. The hybrids showed heterosis in respect of fruit size, earliness and resistance to diseases. The flavour

of the fruits of most hybrids was better than that of the initial forms.

3053 IIZIMA, T.

(Differences in vitamin B₁ content in polyploid water melons, with special reference to the degree of difference in corresponding tissues).

Nagano Kenritsu Norin Semmon Gakko Gakujutsu Hokoku/Bull. Nagano Coll. Agric. For. 1950 : No. 3 : 10-15. [Japanese].

A tetraploid strain of the variety Atarashi-yamato 2 [New Japanese 2] was obtained by colchicine treatment, and a triploid strain by crossing it back to the original diploid. The different parts of the fruits of each type were then analysed for vitamin B₁ and it was found that a general increase in each tissue of the content of vitamin B₁ accompanied the progression $2x \rightarrow 3x \rightarrow 4x$.

3054 **New watermelon announced.**

What's New Crops Soils 1953 : 5 : No. 7 : p. 30.

A new variety of water melon, Dunbarton, has been released by the South Carolina Agricultural Experiment Station. It is anthracnose resistant and produces long green melons of large size and good quality, specially suitable for transporting.

3055 **Fairfax melon released.**

What's New Crops Soils 1953 : 5 : No. 7 : p. 28.

This new water melon, resistant to wilt and anthracnose, has been developed by the US Department of Agriculture at the Southern Vegetable Breeding Laboratory, Charleston, SC. Fairfax melons are long and striped, usually weighing 30-35 lbs.

3056 TAKASIMA [TAKASHIMA], S.

(Studies on the differences between Cucurbita species. III. Morphological differences between species).

Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1951 : No. 1 : 30-41. [Japanese].

A detailed morphological study is presented of a series of Japanese and American varieties of *C. moschata*, *C. maxima* and *C. Pepo* and of some varieties possibly derived from interspecific hybridization.

3057 YAMANE, Y.

(On interspecific hybrids in Cucurbita).

Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : p. 25. (Abst.). [Japanese].

Attempts were made to intercross *C. maxima*, *C. moschata* and *C. Pepo*, but success was only

achieved between *C. maxima* and *C. moschata*. Gametogenesis in the F_1 of this cross is described; meiosis is fairly regular, the usual meiotic configuration being $19_{II} + 2_I$.

- 3058 HUTCHINS, A. E. & YOUNGNER, V. B.
Maternal inheritance of a color variation (chimaera) in the squash, *Cucurbita maxima* Duch.
Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 370-78.

The inheritance of chimeral characters which appeared during the course of breeding at the University Farm, St. Paul, Minn., has been studied in selfed progenies and the F_1 and F_2 of crosses between chimeral and normal individuals, and between chimeral and normal flowers on the same plant. Chimeras were only obtained from female flowers showing a chimeral pattern, suggesting that the chimeral character is cytoplasmically inherited. Most chimeras were unstable and probably mericlinal; some possibly periclinal types were noted, but did not survive far beyond the cotyledon stage.

- 3059 TAKASHIMA, S. & NARA, S.
(Studies on morphological differences in the genus *Cucurbita*. IX. On the occurrence of bisexual flowers).
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1952 : No. 2 : 55-60. [Japanese].

Hermaphrodite flowers were noted in varieties Kanseki and Mikekado of *C. moschata*, but not in *C. Pepo* or *C. maxima*.

- 3060 NAGAO, S. & HAYASE, H.
(Studies on squash hybridization. I. On the growth of pollen tubes in interspecific hybrids).
Idengaku Zasshi/Jap. J. Genet. 1950 : 25 : 27-28. (Abst.). [Japanese].

Pollen tubes developed rapidly in the ovaries in *Cucurbita maxima* x *C. moschata*, *C. moschata* x *C. maxima* and *C. maxima* x *C. Pepo*; slowly in *C. moschata* x *C. Pepo*; and failed to pass beyond the upper region of the ovary in *C. Pepo* x *C. maxima* and *C. Pepo* x *C. moschata*.

- 3061 RICHHARIA, R. H. & GHOSH, P. N.
Meiosis in *Momordica dioica* Roxb.
Curr. Sci. 1953 : 22 : 17-18.

In meiosis of the two male plants examined, 14 bivalents were observed, one of which was heteromorphic.

- 3062 PATEL, G. I.
Chromosome basis of dioecism in *Trichosanthes dioica* Roxb.
Curr. Sci. 1952 : 21 : 343-44.

During metaphase I in *T. dioica* ($2n = 22$) one pair of chromosomes was observed to lie away from the remaining bivalents and to be on a different plane; it also stained more deeply. All the chromosomes were morphologically identical. At anaphase I, this pair showed an earlier separation than the rest. It is suggested that the pair is physiologically distinct and possesses sex-determining genes.

- 3063 KENNERLY, A. B.
Million-dollar business spurs search for better cucumbers.
Sth. Seedsman 1953 : 16 : No. 4 : p. 60.

In trials at the Texas Agricultural Experiment Station, three downy-mildew resistant varieties, SC 10, Magnolia and Robin 40 (cf. *PBA*, Vol. XIX, Abst. 2958), have shown adaptability and promising pickling qualities. SC 10 proved superior in respect of firmness, colour and yield but is rather long for pickling; it has therefore been used as a parent in further crosses to improve shape.

- 3064 WALKER, J. C., PIERSON, C. F. & WILES, A. B.
Two new scab-resistant cucumber varieties.
Phytopathology 1953 : 43 : 215-17.

The pickling cucumbers Wisconsin SR 6 and Wisconsin SR 10, both resistant to scab (*Cladosporium cucumerinum*), have been developed by incorporating the scab resistance of Maine 2 in the standard varieties National Pickling and Chicago Pickling, respectively, by back-crossing (cf. *PBA*, Vol. XXI, Abst. 2225). Scab resistance is controlled by a single dominant gene (cf. *PBA*, Vol. XXI, Abst. 2226). The breeding and testing involved in the production of the two varieties are described in detail.

- 3065 STONER, W. N.
Greenhouse tests of the resistance of Ohio MR17 and Niagara cucumbers to the southern strain of cucumber mosaic virus.
Proc. Fla. Hort. Soc. 1952 : 165-69.

In greenhouse tests, Ohio MR 17 (cf. *PBA*, Vol. XXII, Abst. 802) and Niagara (cf. Abst. 2250) showed susceptibility to the southern strain of mosaic virus.

3066 ZUBKOV, I. A.

(About the tomato marvel again).

Sad i Ogorod (Fruit & Vegetable Gardens)
1953 : No. 2 : p. 79. [Russian].

Multiplication of the Korneevskii [Korneev] tomato (cf. *PBA*, Vol. XXII, Abst. 2306), which did well in the trials at Penza, is advocated. It is interesting for its productiveness and good flavour. In the author's trials it proved earlier than Sparks-Earlana and Budennovka.

3067 American Tomato Yearbook 1953 :
Pp. 40.

The yearbook includes a key to tomato diseases, and lists of relevant agricultural experiment stations in the United States and of recent references dealing with varietal testing and breeding and other aspects of tomato improvement (cf. *PBA*, Vol. XXII, Abst. 3050).

3068 MANUNTA, C.

Fisiogenetica dei pigmenti carotenoidi nei pomodori. (**Physiogenetics of the carotenoid pigments in tomatoes**).
Sympos. Genet., Pavia 1952 : 3 : 381-93.

The literature on the subject is examined. In her own crosses between varieties of *Lycopersicon esculentum* the author has shown *Yy*, determining yellow *versus* colourless skin, and *Rr*, determining yellow *versus* red flesh, to be independent. Genotypes containing *R*, which causes lycopene formation, also have larger quantities of β -carotene. Lycopene formation was inhibited at a temperature of 36°C, which had no effect however on the formation of prolycopene in the "tangerine" varieties, or on β -carotene or other pigments of the chlorophyll, carotene, xanthophyll and anthocyanin groups.

In the F_2 of crosses of *L. pimpinellifolium* x *L. esculentum* variety Palla Oro [Gold Ball], all fruits had yellow skin like the parents; there was segregation for flesh colour but heterosis occurred for pigment content, both phenotypes having higher contents of both β -carotene and lycopene than the mean of the parents; the contents of these two pigments were highly, but not completely, correlated, suggesting that the two are determined by separate genes, closely linked in the same chromosome. Crosses of the yellow varieties Palla Oro and Comet with *L. hirsutum* showed very varied segregation in the F_2 in respect of both lycopene and β -carotene, although the F_1 fruits had all been yellow; this is ascribed to the presence in *L. hirsutum* of a number of inhibitors of *R*. Many of the F_2

segregates had yellow flesh for the same reason and some of these nevertheless had high contents of β -carotene. This again suggests that this pigment is conditioned by a gene, designated *B*, distinct from *R* which governs lycopene.

The variety Tangerine, bearing the gene pair *tt* which converts lycopene into prolycopene, when crossed with red or yellow-fruited varieties gave F_1 generations with all red fruits, showing that Tangerine has the constitution *RRtt* and yellow varieties such as Palla Oro, *rrTT*. The F_2 generations showed the expected segregation and that from Tangerine x Palla Oro included a new phenotype "yellow tangerine", which contained a fair amount of prolycopene, though much less than the true Tangerine. This new genotype probably has the constitution *rrtt* and indicates that *t* can act also in the absence of *R*. In this type again the formation of prolycopene was not inhibited by high temperature, showing that the two stereoisomers *cis* and *trans*, formed under the influence of *R* and *t* respectively, have distinct chains of reactions in their synthesis, though they probably have a common precursor. Segregates combining high contents of β -carotene and ascorbic acid have been obtained in the F_3 of crosses of Comet x *L. hirsutum*; one line contained 4.62 mg. β -carotene and 40 mg. ascorbic acid per 100 grm. fresh weight.

3069 MANUNTA, C.

Ulteriori ricerche sul gene (*t* = tangerine) che influenza nei pomodori la sintesi del prolicopene. [**Further researches on the gene (*t* = tangerine) which influences the synthesis of prolycopene in the tomato**].

Genet. Agr. 1953 : 3 : 204-14.

The gene *T* is responsible for the transformation of prolycopene into lycopene, and when it is doubly recessive (*tt*) tangerine fruits result instead of red. In crosses between the variety Tangerine, of constitution *RRttyy*, and Palla Oro [Gold Ball], of constitution *rrTTYy*, all the expected combinations of flesh and skin colour were found in the F_2 , including one with yellow-tangerine flesh colour, presumed to be of constitution *rrtt* (or *Rrtt*), which, however, contained roughly half as much prolycopene as the tangerine types. This shows that the formation of prolycopene, unlike that of lycopene, is not dependent on the presence of the gene *R*, and its synthesis can evidently take place by a different chain of reactions from that leading to its stereoisomer. This conclusion accords with the fact that temperatures of 36°C inhibit the formation of lycopene but not of prolycopene.

- 3070 TOMES, M. L., QUACKENBUSH, F. W., NELSON, O. E. (JUN) & NORTH, B.
The inheritance of carotenoid pigment systems in the tomato.
 Genetics 1953 : 38 : 117-27.

On the basis of carotenoid analyses of four true-breeding tomatoes, with different pigment complexes, and the F_1 and F_2 progenies produced by crossing these four pigment types in all possible combinations, it is considered that fruit colour depends on three independent genes, B , R and T (cf. *PBA*, Vol. XX, Abst. 1963 and Vol. XXIII, Abst. 741). In the Jubilee tangerine type ($RRttbb$), ζ -carotene and prolycopene are the major components. T , which is present in the red ($RRTTbb$), yellow ($rrTTbb$) and β -orange ($RRTTBB$) types, appears to convert pigments of the Jubilee type into lycopene and β -carotene, while B determines the relative proportions of lycopene and β -carotene in the presence of R and T . The primary action of R is assumed to be the production of an unknown precursor in large quantity. Thus $R-T-$ determines synthesis of lycopene and β -carotene, while $rrT-$ gives the same qualitative system in limited quantity; likewise, $R-tt$ determines the Jubilee tangerine system, while $rrtt$ produces smaller amounts of the same type of pigments.

- 3071 JENKINS, J. A. & MACKINNEY, G.
Inheritance of carotenoid differences in the tomato hybrid yellow x tangerine.
 Genetics 1953 : 38 : 107-16.

Further data are presented concerning the inheritance of colour in F_2 hybrids between yellow ($rrTT$) and tangerine ($RRTt$) tomatoes at the University of California (cf. *PBA*, Vol. XIX, Abst. 2966, Vol. XXII, Abst. 2309 and Vol. XXIII, Abst. 741). Incorporation of tt in a genotype otherwise determining red fruits has no effect on the total carotenoids but alters the relative amounts of individual components. On the other hand, rr interferes with the total carotenoid content, reducing this to 5% of the total characteristic of red fruits. In the double recessive ($rrtt$), therefore, interaction between the two loci is nonadditive, with respect to both carotenoids and constituent pigments.

It is noted that the F_2 segregation ratio conforms with that obtained by MacArthur, namely, 9 red: 3 yellow: 4 tangerine (orange). The failure of Fleming and Myers (cf. *PBA*, Vol. VIII, Abst. 1650) to confirm this result is assumed to have been due to variability of the environment and segregation of genes at other loci.

- 3072 VINOGRADOV, P. I.
(The improvement of tomatoes by intravarietal hybridization).
 Selekcija i Semenovodstvo (Breeding & Seed Growing) 1952 : No. 11 : 25-31.
 [Russian].

In Moldavia and at Mičurinsk, heterosis was observed in several intravarietal hybrids of tomatoes. The heterotic effects were improved by selection in the F_1 , F_2 and F_3 , some F_4 lines proving the most productive. Line 43 of Ficarazzi in the F_4 yielded 18.5 metric tons more fruits per ha. than its parent forms, line 41 of Budennovka 9.4 tons more per ha. than its Budennovka parents and the F_4 lines of Bison outyielded the initial forms by 0.8-10.8 tons per ha. Some F_4 material, including lines 33 and 34 of Bison, was notable for its earliness. Reference is made to mutations observed in some intravarietal hybrids. For instance, some F_3 plants of Bison produced ribbed fruits and other plants bore abnormally large round fruits.

- 3073 MANUNTA, C.
 Analisi genetica della popolazione F_3 degli incroci fra *L. esculentum* e *L. hirsutum*. Selezione di varietà di pomodori caratterizzati da alto contenuto in provitamina A e vitamina C. (**Genetic analysis of an F_3 population of crosses between *L. esculentum* and *L. hirsutum*.** Selection of tomato varieties characterized by high content of provitamin A and vitamin C).
 Genet. Agr. 1953 : 3 : 235-63.

Data are given for the content of β -carotene, lycopene and ascorbic acid in certain tomato varieties introduced from America and some local Italian varieties. In all varieties the synthesis of lycopene was inhibited at 36°C while the quantity of β -carotene remained unchanged, even in varieties with high contents such as the Indiana β -selection. The F_3 of the cross Palla Oro [Gold Ball] x *Lycopersicon hirsutum* contained segregates with greater contents of β -carotene than the parents or the F_1 , some individuals being equal to the American β -selection. The same was true in the F_3 of Cuor di Bue [Ox Heart] and of Comet x *L. hirsutum*, which showed the inheritance of lycopene and β -carotene to be independent. There also appeared segregates with yellow flesh, similar to Palla Oro but genetically different, since they contain the gene R for lycopene synthesis and their yellow pigmentation is ascribed to inhibitors of R derived from *L. hirsutum*. The

evidence suggests that a similar situation exists for the gene *B* for β -carotene, which is also present in *L. hirsutum* but suppressed by three or more inhibitors; genes *R* and *B* are clearly distinct and not modifiers. The inheritance of vitamin C was also independent and contents varied from 16 mg. to 40 mg. per 100 gm. One segregate combined high contents of vitamin C (40%) and β -carotene (4.52%) with almost complete absence of lycopene.

3074 CRAM, W. H.

Hybrid vigor of the Redskin tomato in reciprocal crosses.

Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 415-18.

At the Forest Nursery Station, Indian Head, Sask., results of analyses of the yield, size and shape of the fruit of F_1 hybrids involving Redskin crossed with Farthest North, East Chatham, Earliana and Harkness, and the four reciprocal crosses, suggest the influence of cytoplasmically inherited factors in all but the Harkness hybrids. Farthest North x Redskin gave greater yields than Redskin x Farthest North, though the latter had superior fruit size. Total yields in the other two hybrids and their reciprocals were superior with Redskin as the seed parent in the cross Redskin x Earliana and Early Chatham as the female in the other cross. Factors affecting yield also appeared to modify those determining fruit shape.

3075 LESLEY, J. W. & LESLEY, M. M.

A cytogenetic study of a pleiotropic mutant of the tomato (*Lycopersicon esculentum* L.).

J. Hered. 1952 : 43 : 273-76.

A new mutant, designated cabbage (*cb*), arose spontaneously in the F_2 of 25 plants homozygous for *d* (dwarf) and *y* (nonyellow-skinned fruits) at the Citrus Experiment Station, Riverside, Calif. It has broad dark green leaves, inconspicuous narrow-petalled flowers, few fertile ovules, and less pollen than normal, produced in shrunken anthers. The somatic division preceding meiosis is usually incomplete and results in large pollen mother cells; each containing two diploid nuclei. Subsequently, at meiosis, eight haploid microspores may be formed, but union of chromosome groups at anaphase II frequently gives rise to gametes with 12 or 24 chromosomes; one cell had a restitution nucleus with 44 chromosomes and 4 more in the cytoplasm. The pleiotropic gene, *cb*, is inherited as a simple recessive, situated on chromosome III some 30 cross-over units from *y*.

3076 CICIN, N. V. & NAZAROVA, M. Z.

(Experiments on wide vegetative and sexual hybridization of plants).

Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1953 : No. 1 : 20-35. [Russian].

A vegetative hybrid between the tomato variety Bison and *Cyphomandra betacea* has been developed in Moscow. The hybrid, designated *Lycopersicon cyphomandroforme*, bred true when selfed and produced fruits with good keeping properties, high percentages of sugars and solids and a low seed content. Many new forms were obtained by crossing the vegetative hybrid with tomatoes.

Several promising lines, interesting for their productiveness, were bred from *L. cyphomandroforme* x tomato, variety Lučšii iz Vseh [Best of All]. Some of these lines and the hybrid *L. cyphomandroforme* are being tested at several Soviet breeding institutes.

3077 TROMBLY, H. H. & PORTER, J.

Additional carotenes and a colorless polyene of *Lycopersicon* species and strains.

Arch. Biochem. 1953 : 43 : 443-57.

Analytical data are presented concerning four new carotenes and a colourless polyene discovered in inbred selections from crosses involving *L. esculentum*, *L. pimpinellifolium* and *L. hirsutum* obtained at Purdue University, Lafayette, Ind. (cf. Abst. 742).

3078 SEN, N. K.

Chemical mutagenesis in the tomato.

Bull. Bot. Soc. Beng. 1951 : 5 : 115-25.

Treatment of pollen with nitrogen mustard vapour produced an increased rate of gametic lethal mutation in comparison with the controls, as indicated by the frequency of F_1 plants with pollen abortion. Formalin vapour appeared to be weakly mutagenic. Several other vapours, e.g. those from chloroform, acetic acid, and ethyl alcohol, did not increase the rate of mutation. Two F_1 plants with isochromosomes were found, one after ammonia treatment and the other after exposure to formalin.

3079 PASEČNIK, I. P.

(Breeding for fasciated fruits).

Sad i Ogorod (Fruit & Vegetable Gardens) 1953 : No. 3 : 73-74. [Russian].

A new tomato variety, Savranj, which produces 10-15 kg. good quality fruits per plant, is being tested at Mičurinsk. It was selected from a Budennyi plant which developed some fasciated fruits.

3080 MCGUIRE, D. C.

Storage of tomato pollen.

Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 419-24.

At the Hawaii Agricultural Experiment Station, pollen of San Marzano stored over CaCl_2 or in conditions of high humidity at 0, 10 and 20° C was tested for viability in crosses with male sterile mutants of the same variety (cf. *PBA*, Vol. XIX, Abst. 2173). The highest percentage fruit set was achieved after storage over CaCl_2 at 0° C; the practical limit of storage was found to be six months.

3081 HAMSON, A. R.

Measuring firmness of tomatoes in a breeding program.

Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 425-33.

A pressure tester devised for this purpose at Cornell University, Ithaca, NY, is described in detail. It has been used successfully to reveal highly significant differences between firm and soft fruits produced by hybrids selected from (*Lycopersicon esculentum* x *L. pimpinellifolium*) x (*L. esculentum* x *L. peruvianum*). Total pectin content showed significant positive correlation with firmness, but selection of desirable lines on the basis of pectin content would not be feasible owing to the laborious processes involved in pectin determinations.

3082 COOPER, J. F.

Multiple-resistant Manalucie.

Sth. Seedsman 1953 : 16 : No. 5 : p. 62.

The Manalucie tomato, developed at the Florida Agricultural Experiment Station from crosses involving Rutgers, Indiana Baltimore, Ruby Queen and two small-fruited South American species, combines resistance to the following: *Fusarium* wilt, grey leaf spot, early blight, collar rot, leaf blight and at least one strain of root knot nematode. Since it also carries genes for some degree of resistance to black spot and tobacco mosaic, Manalucie is considered the most valuable breeding stock in Florida, where it has given high yields of large fleshy fruits of superior quality, maturing about the same time as Rutgers.

3083 LOCKE, L. F.

F₁ hybrids as a means of improving homegarden production of tomatoes in the southern Great Plains.

Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 412-14.

Trials of nearly 300 varieties at Woodward, Okla., failed to reveal a single strain capable of

yielding fruit of acceptable size and quality under local conditions. Regardless of adverse climate, however, fruits were always set by a small-fruited variety, Porter. Crosses between Porter and large-fruited strains have produced good quality F₁ hybrids with much larger fruits than those of Porter. These results suggest that reliable hybrids may soon be available for the area.

3084 CONOVER, R. A.

Tomato late blight resistance as affected by races of *Phytophthora infestans*.

Proc. Fla Hort. Soc. 1952 : 147-48.

Promising selections possessing late blight resistance derived from either of two accessions of ornamental tomato, P-1 and P-3, failed to maintain their resistance, as a result of the occurrence of a new race in Florida.

3085 GILBERT, J. C. and MCGUIRE, D. C.

Root knot resistance in commercial type tomatoes in Hawaii.

Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 401-11.

Small-fruited interspecific hybrids with homozygous resistance to root knot nematode derived from *Lycopersicon peruvianum* (cf. *PBA*, Vol. XX, Abst. 2695) have been back-crossed four times to *L. esculentum*. Selections with commercially acceptable fruits are not as resistant as the small-fruited lines, but their moderate resistance has been maintained for four generations; they also combine resistance to *Fusarium* wilt, spotted wilt virus and grey leafspot. F₁ hybrids between these selections have excelled local commercial varieties in respect of earliness, vigour and fruiting capacity under unfavourable weather conditions.

Selections with nematode resistance were also crossed with a mosaic resistant hybrid of complex ancestry, involving *L. hirsutum*, *L. pimpinellifolium*, *L. peruvianum* and *L. esculentum*. Offspring combining a high degree of resistance to mosaic and nematodes did not have such large fruits as the original nematode resistant selections.

3086 GARDNER, E. J.

Studies on the inheritance of resistance to curly top and vitamin C content in tomatoes.

Proc. Utah Acad. Sci. 1949-51 (1952) : 27 : 69-70.

Approximately 1% of over 700 hybrids from crosses between *Lycopersicon pimpinellifolium* and *L. esculentum* were susceptible to curly top.

Under the same conditions about 20% of the commercial varieties showed symptoms. The F_1 of *L. pimpinellifolium* x *L. esculentum* variety Livingstone Beauty had an ascorbic acid content of $48.9' \pm 1.09$ mg. per 100 gm., being intermediate between the parental values.

- 3087 HUTTON, E. M. and PEAK, A. R.
Spotted-wilt development in resistant and susceptible *Lycopersicon* species.

Aust. J. Agric. Res. 1953 : 4 : 160-67.

At temperatures ranging from 60 to 87° F, *L. peruvianum*, Porter's strain of *L. pimpinellifolium* and the variety Rey de los Tempranos [King of the Earlies] of *L. esculentum* showed varying degrees of resistance to a mixture of strains of spotted wilt virus maintained at Canberra, Australia. Maximum virus inactivation was, however, expressed at 90° F. Although *L. peruvianum* showed the highest degree of resistance, Rey de los Tempranos proved superior with respect to recovery after early infection, transmission of resistance to hybrid progenies and ease of hybridization with commercial varieties, and may therefore be a promising parent. It is suggested that inoculation at 90° F may facilitate the selection of resistant individuals.

- 3088 OINUMA, T.
(Cytological studies in the genus *Solanum* with special reference to the caryotypes).
Idengaku Zasshi/Jap. J. Genet. 1949 : 24 : 182-89. [Japanese].

This paper is an extended version of that reviewed in Abst. 2262.

- 3089 PRAKASH, R. and CHATTERJEE, B.
Cytological study of *Solanum macranthum* Dun.
Curr. Sci. 1953 : 22 : 84-85.

Three sterile introductions at Sabour, Bihar, were found to have a haploid chromosome number of $n = 12$. Orientation of bivalents at metaphase of meiosis was very irregular, leading to several different numerical distributions during anaphases I and II. The pollen mother cells formed 2 to 7 cells; the usual number was however 4. Only 40% of the grains were stainable. Selfing and reciprocal crosses with cultivated brinjal have been attempted, in the hope of inducing fruiting.

- 3090 ARGIKAR, G. P.
***Solanum Melongena* var. *bulsarensis* var. nova, Argikar.**
Curr. Sci. 1952 : 21 : 226-27.

The above variety, discovered at Dharwar,

Bombay State, is described. It appears to be most closely related to var. *inermis* Dunal. Crosses between the new variety and some Gujarat varieties failed.

- 3091 VENKATARAMANI, K. S.
A preliminary study on some inter-varietal crosses and hybrid vigour in *Hibiscus esculentus* L.
J. Madras Univ. 1952 : 22 : 183-200.

F_1 plants of seven intervarietal crosses studied at the Botany Laboratory, Madras University, were intermediate between their parents with respect to height, and were either earlier than their respective early flowering parents, or as early. F_1 fruits were intermediate in size, or longer than the parental ones; the number of fruits produced per plant was higher or intermediate, compared with the parental numbers. Five of the crosses showed yield increases of 5.4-14.5% over the parent giving the better yield. The feasibility of commercial F_1 hybrids therefore merits investigation. Deep lobing of the leaf was dominant over shallow. Dark green colour of the plant showed dominance over light green; green coloration in general was recessive to greenish red.

- 3092 PERKINS, D. Y., MILLER, J. C. and DALLYN, S. L.
Influence of pod maturity on the vegetative and reproductive behavior of okra.
Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 311-14.

After allowing pods to mature on the plant, subsequent growth, flowering and pod formation were more completely inhibited in Louisiana Green Velvet and Louisiana Market than in Gold Coast at Baton Rouge, La. The harvesting period of all varieties was lengthened, however, by frequent picking to prevent this inhibitory effect.

- 3093 De Peulvruchten Studie Combinatie in 1949. (The Pulses Study Group, 1949).
Wageningen 1949 : Pp. 53.

This report (cf. Abst. 2264) presents detailed information on the cultivation of pulses in the Netherlands and on the performance of types and varieties of peas and beans on different soils in various districts. Quality and resistance to diseases in peas and beans were also extensively studied.

Lupins. The breeding of lupin seed for human consumption was carried on and tests showed that lupin flour as a substitute for almonds in

confectionery was highly successful. The quality of the commercial varieties and strains in Holland has greatly improved: Neven contains very few bitter seeds, but was surpassed to some extent in yield by Vossen in most test plots. Weiko II with indehiscent pods is being tested for inclusion in the official list of varieties of crops.

Beans. Promising strains of dwarf French beans, combining complete resistance to bacterial blight with good yield, have been bred.

A white-seeded mutant of the brown variety Candida was obtained by X irradiation.

The Excelsior white bean has been renamed Exponent.

Dutch seed firms are also engaged in breeding climbing French beans and dwarf runners. Many new commercial varieties, bred by various concerns, are listed, with notes on their merits and defects, including their reaction to roll mosaic, wilt, top necrosis and other virus diseases.

A West Friesland horticultural association has found that, in the cross *Phaseolus vulgaris* x *Ph. coccineus*, French varieties of kidney beans, used as the female parent, gave a higher set than Dutch varieties. The F_1 is being crossed to a dwarf French bean to combine its favourable characteristics with the virus resistance of *Ph. coccineus* and some degree of cold resistance. Another concern in West Friesland is studying a spontaneous cross of *Ph. vulgaris* x *Ph. coccineus*. Some American seed of *Ph. polystachios* (the so-called "Wild Kidney Bean") and of wild, Mexican forms of *Ph. vulgaris* were received from America for use in hybridization.

Soyabean. Breeding for quality and yield was continued.

Peas. Strains of round green peas resistant to American wilt due to *Fusarium* infection have been evolved and tests for quality and agricultural characteristics will be carried out. Attention is being given to the relation between yield and (1) resistance of varieties to foot rot and (2) soil conditions.

The new marrow-fat pea Dr. Mansholt 710/41 has been included under the name Emigrant in the Netherlands Official Variety List.

Breeding and variety trials of dun and grey peas are proceeding and long-straw types that are being tested with a promising short-straw maple pea in various districts are listed.

In trials of short-strawed varieties the dun pea Aureool proved outstanding in yield, while Vinco was the best in the maple group.

The dun peas Wijker Vale, Platte Vale and the maple pea Noord Holland are being treated with X rays to obtain early short-strawed mutants. The breeding of shelling and sugar peas is directed mainly towards the production of types suitable for canning or freezing. By crossing with Delicatesse, races have been obtained with a very high seed/pod ratio.

In collaboration with the Phytopathological Service tests for resistance to foot rot and American wilt were conducted.

An edible-podded, late, smooth-seeded, membrane-free and productive pea, Pum-peul, bred by S. J. Wellensiek, has been offered for registration. It has now been crossed with the earliest wrinkled shelling peas to obtain a very early race with wrinkled, sweet seeds as well as the desirable Pum-peul features.

The National Horticultural Advisory Service, Amsterdam, is raising the F_1 from crosses of their own strains of Schellingerhout x Hendrikspeul with Wellensiek's Pum-peul and with the variety Dwarf Grey Sugar.

Various bodies collaborated in research on quality. Mattson's findings on the relation between phytin content and the cooking properties of green peas (cf. *PBA*, Vol. XXI, Abst. 2274) were confirmed, but no such correlation was found for dun or marrow-fat peas. The causes of hard and soft pods were studied from the biochemical standpoint.

3094 BALLATORE, G. P.

Alcune varietà di fava. (Some varieties of broad bean).

Ital. Agric. 1953 : 90 : 267-78.

Full descriptions are given of Baggiana, S. Pantaleo and Leonforte, the three main varieties cultivated in Sicily. Work on their improvement has started and consists in selecting the best types in respect of earliness, yield and disease resistance.

3095 MÜLLER, H. J.

Über die Ursachen der unterschiedlichen Resistenz von *Vicia faba* L. gegenüber der Bohnenblattlaus *Doralis fabae* Scop.

[On the causes for the differential resistance of *Vicia faba* L. to the bean aphid (*Doralis fabae* Scop.)].

Züchter 1953 : 23 : 176-89.

A large number of German varieties were tested. In mixed stands of Rastatter and Schlanstedter it was shown that the aphid preferred the latter variety. Where the two varieties were planted some distance apart, the number of aphids arriving at the two plots was equal, but whereas a significant proportion of

the immigrants remained on Schlanstedter, only few remained on Rastatter.

3096 QUANTZ, L.

Untersuchungen über ein samenübertragbares Mosaikvirus der Ackerbohne (*Vicia faba*). [Investigations into a seed-borne mosaic virus of the broad bean (*Vicia Faba*)].

Phytopath. Z. 1953 : 20 : 421-48.

A virus attacking *V. Faba*, and not as yet identifiable with any previously known virus, was isolated and given the name of *Viciavirus varians*. It exists in several strains. Virus strains EV 11, EV 36, EV 100, EV 14, EV 205 and EV 11 M are found in *V. Faba*; W 115 and W 116 in *Vicia sativa*; W 283 in *Lathyrus tingitanus*; and E 271 in peas. Symptoms of the virus are the pigmentation, deformation and withering of the leaves, necrosis, the appearance of transparent spots on the leaf, and in advanced stages stunting of the whole plant.

In investigations into 23 varieties of bean and 69 varieties of peas, none were found to be resistant, even varieties of peas such as Perfection and Surprise, resistant to other viruses, being attacked. Under natural conditions, however, the virus mainly appears to attack *V. Faba* and other leguminous plants in close proximity to it. An attenuated strain (EV 11m) of EV 11, the most widely spread and most virulent type, appeared during the investigations into peas, and it was found that previous infection with EV 11m provided immunity against EV 11. Relative immunity against EV 11, which produces withering, was also given by previous infection with EV 14, which produces curling and pigmentation but no withering.

3097 BURKART, A. and BRÜCHER, H.

Phaseolus aborigineus Burkart, die mutmassliche andine Stammform der Kulturbohne. (*Ph. aborigineus* Burkart, the supposed Andean parental form of the cultivated bean).

Züchter 1953 : 23 : 65-72.

A wild bean from the Tucumán province of Argentina, where it is still used for food by the local population, is described. It is a true wild form with small, dark-coloured seeds and dehiscent pods and ripens two months or more later than the garden bean. Root-tip counts showed 22 chromosomes, and fertile seeds were obtained in crosses with *Ph. vulgaris* and *Ph. coccineus*, though not with *Ph. lunatus*. The mature plants are tolerant of -4°C but the

species does not possess any other properties of resistance that would be of interest in breeding.

3098 MCCOLLUM, J. P.

Factors affecting cotyledonal cracking during the germination of beans (*Phaseolus vulgaris*).

Plant Physiol. 1953 : 28 : 267-74.

Varieties of snap beans showed marked differences in susceptibility to cotyledon cracking during germination. Susceptibility depended upon seed coat permeability and rapid imbibition of water.

3099 HOFFMAN, J. C. & KANAPAU, M. S.

Relation of crude fiber and dry matter contents to appearance and water loss of snap beans.

Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 363-66.

Results of a study of the pod characters of several commercial varieties and breeding lines developed at the Charleston Vegetable Breeding Laboratory, SC, show that differences in appearance and water loss, under conditions comparable with those experienced between harvest and marketing, are not correlated with either dry matter or fibre content. Wade and B 1788 lost less water than other varieties and are therefore most suitable for transporting; their fibre content is not high.

3100 BADINA, G.

(*Phaseolus* in the Leningrad province).

Kolhoznoe Proizvodstvo (Collective Farming) 1953 : No. 3 : p. 62. [Russian].

At the Leningrad Agricultural Institute, several varieties of beans proved hardy, early and productive and showed resistance to pests and diseases. The best varieties grown for their pod included Kustovaja Saharnaja Otbornaja [Selected Dwarf Sugar], developed at Leningrad, Ščedraja [Generous], originating from the Siberian Institute of Grain Farming, and Kustovaja Bez Volokna [Dwarf Stringless], Nantskaja Želtaja [Yellow Nantes] and Triumph which were bred at Gribovo. Belorusskaja 431 [White Russian 431] and Latviiskaja Mestnaja 8 [Local Latvian 8] were the best varieties for production of haricot beans.

3101 Seminole released to producers.

Sth. Seedsman 1953 : 16 : No. 6 : p. 36.

A new snap bean, Seminole, has been released for seed increase by the Everglades Experiment Station, Fla. It is resistant to mildew, common mosaic and locally prevalent strains of rust. In trials at 18 centres during 1952, Seminole

matured 2-3 days later than Tendergreen, but consistently outyielded the latter variety which it closely resembles. The pods of Seminole are, however, smoother, longer and more rounded than those of Tendergreen.

- 3102 TOCHINAI, Y. & SAWADA, K.
(On the distribution of bean anthracnose in Hokkaido and on physiological races of the fungus causing the disease which differ in pathogenicity).

Hokkaido Nogyo Shiken Jo Iho/Res. Bull. Hokkaido Nat. Agric. Exp. Sta. 1952 : No. 63 : 78-83. [Japanese].

Colletotrichum Lindemuthianum exists in a number of different strains in Hokkaido. One strain attacks varieties, such as Otebo, which have so far proved resistant to the strains occurring naturally in the area where they are grown.

- 3103 Texas Cream 12 gives 'black eye' to *Fusarium* and root knot.

Sth. Seedsman 1953 : 16 : No. 5 : p. 59.

Texas Cream 12, a cream-seeded variety of southern pea (*Phaseolus*) derived from crosses between California Blackeye and locally adapted varieties with cream seeds, has been released by the Texas Agricultural Experiment Station. It has given high yields on soils infested with *Fusarium* wilt and root knot nematode. The pods are readily accessible for harvesting by hand or machine.

- 3104 KLINKOWSKI, M. & BEHR, L.
Die "Schwarzbeinigkeit" der *Phaseolus*-Arten. ("Black leg" in *Phaseolus* species).

Phytopath. Z. 1953 : 20 : 405-20.

Black leg, first reported from Central Germany in 1948, is shown to be the hypersensitive reaction of certain bean varieties, such as Mombacher, Juli and Bernberger Schwarze, and crosses in which one of these varieties is the parent, to common bean mosaic virus (*Marmor phaseoli*). It is therefore identical with black root in the USA.

- 3105 JOHNSON, J. C.
Common bean mosaic yield trial, 1952.

Qd Agric. J. 1952 : 75 : 350-52.

Two susceptible strains of the bean variety Brown Beauty showed a 15% yield reduction in the main harvest, when infected with mosaic in a trial at the Redlands Experiment Station, Queensland. Strain 17, a recent selection of this variety which has exhibited immunity in

greenhouse tests, suffered no yield reduction. Resistance to this virus should therefore be given attention in selection and breeding.

- 3106 ALLARD, R. W.
Inheritance of hypocotyl color in lima beans.

Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 387-90.

Segregation for hypocotyl colour has been studied at Davis, Calif., in the F_1 , F_2 and F_3 hybrids obtained by crossing commercial varieties possessing green hypocotyls with red, red-purple and purple strains. The three gene pairs determining hypocotyl colour are designated *Cc*, *Rr* and *Pp*. The genotype containing *C*, *R* and *pp* produces red hypocotyls; that containing *C*, *rr* and *P*, purple; and *C*, *P* and *R*, red-purple. It is thought that *P* and *R* may act on a common precursor, producing purple and red, respectively; apparently both alleles compete equally successfully for the precursor, since neither pigment predominates if both alleles are present. Green hypocotyls are determined by the genotype *CC pp rr* or any genotype with the homozygous recessive *cc*. Purple flowers occur as a pleiotropic effect of *P*. The three loci are independently inherited.

- 3107 New variety of cream peas reported from Tyler, Texas.

What's New Crops Soils 1953 : 5 : No. 8 : p. 28.

Texas Cream 12, a bush cowpea bred by the Texas Agricultural Experiment Station, is to be released for seed increase. The variety has yielded well on disease-infested soil. Its erect growth habit and close grouping of nonshattering pods are well suited to mechanical harvesting of the dry seed.

- 3108 NITTA, K.
(Studies on the oil and protein contents of soya bean seed).

Hokkaido Nogyo Shiken Jo Iho/Res. Bull. Hokkaido Nat. Agric. Exp. Sta. 1952 : No. 63 : 64-69. [Japanese].

Information is provided on the content of water, oil, protein, fibre and soluble nonnitrogenous substances in the seeds of a large number of Japanese varieties. Data are also provided on the effects of artificial short days, intercropping with wheat and pod borer attack on oil and protein content. In general oil content is positively and protein content negatively correlated with earliness. A method for selecting grains for either oil or protein content was devised, based on determining the specific

gravity of the seeds in a mixture of $\text{CCl}_4 + \text{C}_2\text{H}_5\text{OH}$.

3109 MUKASA, K. & ICHINOHE, M.

(On the application of the relative index system to the study of varietal differences in the soya bean in respect of parasitism by the eelworm *Heterodera schachtii*).

Hokkaido Nogyo Shiken Jo Iho/Res. Bull. Hokkaido Nat. Agric. Exp. Sta. 1952 : No. 63 : 117-20. [Japanese].

Significant differences between Japanese varieties in degree of infestation by *H. schachtii* have been detected by means of the relative index system devised by A. L. Smith and A. L. Taylor.

3110 SATO, I. & NISHIKAWA, M.

(Damage to soya beans due to bugs. The connexion with variety and sowing time).

Tottori Nogaku Kai Ho/Trans. Tottori Soc. Agric. Sci. 1951 : 9 : 55-60. [Japanese].

Spring-sown varieties, especially those that flower earliest, are more prone to attack by *Nezara antennata* and *Riptortus clavatus* than summer-sown varieties.

3111 CALMA, V. C. & ROSARIO, C. V.

A study of the adaptability to Los Baños conditions of eleven varieties of soybean.

Philipp. Agric. 1951 : 35 : 375-78.

All 11 soya bean varieties obtained from the US Department of Agriculture were dwarfed in the dry season at the College of Agriculture, Laguna, Philippines, but differential growth habits were obvious during the wet season. Creole, Palmetto and Monetta gave highest average yields of seed and haulm over both seasons; Seminole, which has the largest seeds, outyielded other varieties in the dry season.

3112 IZBITSKIĬ, H. & ČERNOV, P.

(A model method of growing peas).
Kolhoznoe Proizvodstvo (Collective Farming) 1953 : No. 4 : p. 61.

A productive variety of pea, Greitukai, interesting for its high quality seed, has been developed at the Lithuanian State Breeding Research Station.

3113 MIRAVALLE, R. J. & SWENSON, S. P.

Tenth annual report of pea improvement work.

Wash. Agric. Exp. Sta. 1952 : Pp. 15. (Mimeographed).

The results of trials of 53 varieties, strains and new hybrid selections are reported. A yield

summary of trials during 1943-1952 is also provided.

Two F_5 lines of Alaska x Austrian Winter are segregating for a gene causing yellowing of the pedicels and pods. This gene appears to be similar to, if not identical with, one of the multiple alleles of the *o* series. One of these lines is also segregating for light hilum and clear seed-coat on the one hand and dark hilum and brown seed-coat on the other. The genes for all the above characters do not show the linkage relationships postulated by Lamprecht. Individual plant and bulk selections were received from progenies of 24 crosses.

Plants with a high percentage of double pods and good vigour were selected from a large number of introductions.

Seed stocks of 29 linkage testers and 7 recently discovered mutants were increased for genetical purposes.

Studies were made of three chlorophyll deficient mutants, X-28, X-33 and Cl_4 . X-28 and X-33, ivory-coloured and yellowish-green, respectively, were obtained from a line treated with X rays; they are both lethal at the seedling stage. The spontaneous, nonlethal mutant Cl_4 is a normal green up to the second or third node; above this node the plant is yellowish-white to albino; it shows some resemblance to the mutant type *xantha terminalis* described by Lamprecht (cf. *PBA*, Vol. XXII, Abst. 3083).

3114 LAMPRECHT, H.

New and hitherto known polymeric genes of *Pisum*.

Agric. Hort. Genet., Landskrona 1953 : 11 : 40-54.

An analysis of the progeny of a cross between two bracteoleless strains with concave pods, having the genotypes *Le N Con br* and *le N Con br*, has provided evidence for the existence of two new polymeric genes, *Co* and *Bra*. The recessive *co*, in the presence of *con* (cf. *PBA*, Vol. VIII, Abst. 1659) controls the development of convex pods, whereas bracteoles are dependent on *Bra* in conjunction with another dominant gene, *Br* (cf. *PBA*, Vol. XXI, Abst. 3150). Segregation ratios from another cross between strains with genotypes *A ar b d gl pur* and *A Ar B D Gl Pur* indicated the existence of a gene *Pu*, which produces a purplish-violet pod colour in the presence of *Pur* (cf. *PBA*, Vol. XI, Abst. 1142). Gene maps are as follows: for chromosome I, *A-Vi₁-Lf-D-Pur-Sp-O-Red-I*; and for III, *Uni-M-Mp-F-Pu-Cry-St-B-Gl*. Other known polymeric genes of *Pisum* are listed.

3115 LAMPRECHT, H.

Ein neues Gen *Rf* und die Genenkarte von Chromosom III von *Pisum*. (**A new gene *Rf* and the gene map of chromosome III of *Pisum***).

Agric. Hort. Genet., Landskrona 1953 : 11 : 55-65.

The new gene *Rf* (*radicula fulva*), when dominant and in association with *Az* and *Mp* or *mp*, conditions brown colouring over the radicle, ranging from pale brown to distinct mid-brown. Its locus is between *M* and *Mp* on chromosome III, in which ten genes in all have been located, in the following order: *Uni-M-Rf-Mp-F-Pu-Cry-St-B-Gl*. The relative positions, however, of *F*, *Pu* and *Cry* in the middle of the chromosome have not yet been elucidated. Linkage between *S-Wb-K* in chromosome II and between *R* and *Tl* in chromosome VII was also confirmed.

3116 LAMPRECHT, H.

Ein neuer Fall von multipler Allelie bei *Pisum*. (**A new case of multiple allelomorph in *Pisum***).

Agric. Hort. Genet., Landskrona 1953 : 11 : 28-39.

Linkage data indicate that Fedotov's gene *Fs* (cf. *PBA*, Vol. VII, Abst. 361) and Lamprecht's gene *Ast* (cf. *PBA*, Vol. VII, Abst. 1395) must lie at the same locus in chromosome V, and recent crosses have shown that these two genes should be replaced by *U*, now held to be one of the allelomorph series *U-U_{st}-u* determining respectively all-violet, violet-striped and neither violet nor striped seed coat. The linkage in chromosome V between *U*, *Gp* and *Cp* has been found to agree with that previously recorded for *Ast*.

The problem of Fedotov's gene *V₁*, which modifies the uniform dark, violet testa, is also briefly touched on and the possible existence of homology between the *U* allelomorph series in *Pisum* and the *R* series in *Phaseolus vulgaris* is discussed.

3117 LAMPRECHT, H.

The mathematical and genetical evaluation of segregation ratios.

Agric. Hort. Genet., Landskrona 1953 : 11 : 1-14.

Using data from experiments with *Pisum*, the author shows that calculations carried out by the product-ratio method are preferable to the method of maximum likelihood for evaluating monohybrid and dihybrid segregations, cross-over values and ratios influenced by semi-sterility and the position of the point of breakage within a single interchange. In all cases the

first method is quicker than the second. The importance of considering the number of sown seeds as well as the number of fully developed plants in all calculations, particularly those used to demonstrate linkage, is emphasized. It is thought that many erroneous linkages reported in *Pisum* may be attributed to this neglect.

3118 LAMPRECHT, H.

Ein Gen für schmale Hülsen bei *Pisum* und seine Koppelung. (**A gene for narrow pods in *Pisum* and its linkage relations**).

Agric. Hort. Genet., Landskrona 1953 : 11 : 15-27.

Following genetic analysis of crosses between *Pisum* lines, the author records a new recessive gene *te* (*tenuis*) for narrow pod. The allelomorph *Te* is incompletely dominant, the average breadth of pod in *Tete* individuals being about 12.5 mm. and in *TeTe* plants 13.5 mm.

Te is strongly linked with *Cp* and *Gp*; and the order of the genes along chromosome V can now be written as *Cp-Gp-Cr-Cri-Te-Fs-Ast*, but the relative position of *Cr-Cri* and *Te* is not yet certain.

The writer advances evidence to show that, contrary to Lamm's view (cf. *PBA*, Vol. XVII, Abst. 1355 and Vol. XIX, Abst. 2197), the gene *Wa* cannot lie in chromosome V.

3119 SAYRE, C. B., TAPLEY, W. T. & BARTON, D. W.

Variety comparison of peas used for canning and freezing, 1952.

Bull. NY St. Agric. Exp. Sta. 1953 : No. 758 : Pp. 31.

Investigations were made into 14 canning and 10 freezing varieties of peas to determine comparative yield, quality and time of maturing. The canning varieties Surprise, Ace, Perfection and Shoshone, and the freezing varieties Thomas Laxton, Perfected Freezer, Dark Green Perfection, Dark Seeded Perfection, Pluperfect and Hyalite gave the best results.

3120 WUNDERLICH, G.

Ertragsanalytische Untersuchungen an vier Erbsensorten bei verschiedener Bestandesdichte. (**Analytical investigations into the yield of four varieties of peas when spaced at different distances**).

Bodenkultur, Wien 1953 : 7 : 1-9.

The varieties Lincoln, Salzmünder Edelperle [Salzmünder Pearl], Wunder von Amerika [American Wonder] and Wunder von Kelvedon [Kelvedon Wonder] were compared. All four varieties produced their maximum yield per

given area when spaced at intervals of 5 cms., but Lincoln and Salzmünder Edelperle yielded considerably more per plant than the other two varieties at spacing distances of 10 and 15 cms.

3121 ARGIKÁR, G. P.

Some unreported mutations in *Cicer arietinum* L.

J. Indian Bot. Soc. 1952 (1953) : 31 : 362-69.

True-breeding mutants distinguished by the following characters are described: alternate leaflets, monogenically determined; long bunches; gigantism; fascicular leaflets; and enlargement of the vegetative and reproductive parts. The type with the latter characteristic is probably a polyploid.

3122 BROWN, W. N.

Developmental morphology of pericarp blistering in sweet corn (*Zea Mays* L.).

Diss. Abstr. 1953 : 13 : Publ. No. 4416 : p. 3.

A comparison of kernels of nonblistered and blistered inbreds and of hybrids from reciprocal crosses between these inbreds indicated that the chief factors affecting abgerminal blistering were endosperm shrinkage, resulting from the composition and amount of reserve materials, and the size and position of acellular cavities in the endosperm. Rate of pericarp development and lignification, and also the final structure and thickness of the pericarp were influenced by the pollen parent. Data from the hybrids showed that in the production of single cross seed, blistering can be reduced or eliminated by suitable choice of the inbred used as pistillate parent.

3123 **New sweet corn hybrids available in New Jersey.**

What's New Crops Soils 1953 : 5 : No. 8 : p. 29.

Two sweet corn hybrids, New Jersey 101 and 106, bred at the New Jersey Experiment Station, are released for farm trials. NJ 101 has ears with 12-14 kernel rows and tight husks, is resistant to smut and bacterial wilt and matures in 75 days. NJ 106 matures 4-5 days earlier than NJ 101, and has 12-rowed ears; at Burlington, NJ, it produced 29% more marketable ears than Marcross.

3124 YARNELL, S. H.

Breeding sweet corn for resistance to the corn earworm.

Proc. Amer. Soc. Hort. Sci. 1952 : 60 : 379-86.

A review of breeding in the USA compares the

success achieved from work with commercially grown single crosses, inbreds developed from experimental crosses, inbreds secured by selfing introductions, and experimental F_1 hybrids. Particular reference is made to the selection of resistant M inbreds derived from crosses involving either Wappoo or Kiawah. Further crosses between resistant lines are contemplated in an attempt to determine the mode of inheritance of factors for resistance.

3125 ANDERSON, E.

The popcorns of Turkey.

Ann. Mo. Bot. Gdn. 1953 : 40 : 33-48.

From a study of 54 collections, grown in Iowa, it is concluded that the highly heterogeneous popcorns of Turkey have been largely derived from the mingling of two races, the Aegean and Asiatic. Further diversity has also resulted from the comparatively recent introduction of modern commercial varieties. In its purest form the Asiatic race is characteristic of the mountainous areas in north-eastern Turkey; the Aegean race is most common along the coast.

3126 JOHNSON, I. J. & ELDREDGE, J. C.

Performance of recovered popcorn inbred lines derived from outcrosses to dent corn.

Agron. J. 1953 : 45 : 105-10.

Progress is reported in a programme of improving agronomic characters of popcorn inbreds by outcrossing to dent maize at the Iowa Agricultural Experiment Station. Hybrids were back-crossed once or twice to their popcorn parents and selfed four or five times. When combined with a single cross tester, the resulting inbreds produced three-way crosses equal in popping volume and superior in respect of lodging resistance and yielding ability to the original inbred lines. Improvement in yield was due mainly to increases in ear size. The easy recovery of the popping quality of the popcorn parents suggests a comparatively simple mechanism of inheritance for this character.

3127 BAXTER, J. W. & CUMMINS, G. B.

Physiologic specialization in *Puccinia menthae* Pers., and notes on epiphytology.

Phytopathology 1953 : 43 : 178-80.

Fifteen physiological races of *P. Menthae* in North America have now been identified (cf. *PBA*, Vol. XXII, Abst. 2358). Strain P-13 of *Mentha spicata* was immune from all 15 races.

BOOK REVIEWS

CHRISTMAN, R. C. (Editor).
Soviet science.

American Association for the Advancement of Science, Washington, DC 1952:
\$1.25: Pp. vii + 108.

As the foreword to this symposium points out, it would be hard to find a scientist today, whatever his field of interest, who has not been made aware of political intervention in the field of genetics. There is a tendency on the part of some scientists to generalize from this and suppose that all sciences are in equally dire straits. Others, on the other hand, tend to regard genetics as a special case and assume that other fields of science give no cause for concern. To elucidate this and other aspects of the problem a symposium was held on 27 December 1951 at the Philadelphia meeting of the American Association for the Advancement of Science, and the volume before us embodies the proceedings.

The first contribution is on *Russian Genetics* by T. Dobzhansky, in which the all-too-familiar story (cf. *PBA*, Vol. XVI, p. 365) is again recounted. In the next essay, W. Horsley Gantt reviews the situation in physiology and pathology, prefacing his remarks by an outline of Russian achievements before the Revolution. We see a depressing parallel with the case in genetics: a flying start, in the early Soviet days, a series of purges, increasing isolation from international scientists and intervention from party politicians and subservience to certain official authorities. This author, as well as some of the later contributors, draws a significant parallel with certain developments at the present day in the USA.

The position in other sciences is outlined by a number of competent authorities on psychology, social science, soil science, physics, chemistry and mathematics. In an essay on *Science and intellectual freedom in Russia* L. Volin contrasts the high degree of freedom in prerevolutionary Russia with the situation today, with purges of geneticists, philosophers, economists, geographers, historians, physiologists, physicists, orientalist, and others. Many of the authors point to parallels with the Hitler system in Germany and stress the loss to Soviet production as well as scientific standard that has accrued from misguided methods. The concluding essay is a summing-up by C. Zirkle, whose general

conclusion is best expressed in his own words as follows "the quality of Soviet science varies from the best to the worst; at one extreme, in genetics, it is an archaic quackery without honesty and without intelligence; at the other, in mathematics, it is sound and original, a science of which any country could be proud. Secondly, we may note that Soviet science is in flux and is changing not only from year to year but from week to week. In some respects it is improving, but in many it is still deteriorating, and deteriorating rapidly. Paradoxically enough, the very attempt to control science has resulted in science, or more accurately the substitutes for science, getting out of control. Now it is well beyond the power of the Communist authorities, certainly it is beyond their skill, to restore all their scientific disciplines to health and sanity. Their efforts are more likely than not to result in increasing the spread of chaos. Soviet science remains sound only where the commissars have not meddled, only where the scientists have been free to follow where their discoveries have led. In certain of the sciences it is too late to free scientists, for there are fields now in which no scientists remain." Some devastating citations are given from official pronouncements and finally certain cases are mentioned in which the authorities have reversed a policy or reinstated it under a slightly modified name, as in the technique of maize breeding: "inbreeding" is still banned but hybrid corn is produced by a process known as the production of "interlinear hybrids." Thus a faint hope is envisaged that wiser councils may eventually prevail where questions of practical expediency are involved.

Supplement to the catalogue of Lewis's medical, scientific and technical lending library, supplement 1950-1952.

H. K. Lewis & Co. Ltd., London 1953:
subscribers 3s.: non-subscribers 6s.: Pp. 288.

The above supplement has now appeared. A review of the revised addition of this reference book, published in 1950, may be found in *Plant Breeding Abstracts*, Vol. XXI, p. 712. For further detailed information see also *Plant Breeding Abstracts*, Vol. XV, p. 372 and Vol. XVII, p. 493.

DAVID, F. N.

A statistical primer.

Charles Griffin & Co. Ltd., London 1953:
22s.: Pp. x + 226: figs: tables.

The publishers of this modest volume of 226 pages are well known for their production of the *Introduction to the Theory of Statistics*, first written by G. O. Yule, but in later years revised and brought up to date by M. G. Kendall (cf. *PBA*, Vol. XXII, p. 311), and also for their large two-volume issue *Advanced Theory of Statistics*, by M. G. Kendall (cf. *PBA*, Vol. XVI, p. 245). This later addition to the publishers' statistical series is intended as a very elementary introduction to the ideas and methods of statistics, and is designed to appeal to the non-mathematical scientist. The usual treatment is followed for the first 80 pages. Thereafter the important question of devising tests of significance for the mean of a normal sample covers four consecutive chapters, while three more are given to other such tests. An attempt is made to show the nature of the test for a mean by actually drawing a large number of random samples and working out experimentally the distribution of the sample means. This method has an appeal to certain classes of reader.

The remaining chapters deal with the binomial and Poisson distributions, and with the uses of the well-known χ^2 criterion, first as an index of dispersion and then in goodness-of-fit tests. Simple but sufficient tables are provided throughout the text to enable the various tests to be made by the reader.

J. W.

KAPPERT, H.

Die vererbungswissenschaftlichen Grundlagen der Züchtung. (**The genetical bases of breeding**).

Paul Parey, Berlin & Hamburg 1953: 2nd ed.: bound DM 25: unbound DM 22: Pp. vii + 335: 100 figs: tables.

The second edition of this book (cf. *PBA*, Vol. XIX, p. 667) has, as the title implies, enlarged its scope somewhat to include the principles of animal as well as plant breeding. The main body of the text remains substantially the same, though a few sections have been slightly expanded, reduced or reworded. The order of some of the sections has been altered to lead to a more logical sequence, cytological processes now being explained before the mechanism of gene action and mutation. Examples from animal breeding have been interpolated at appropriate places and a series of headings has been introduced to break the close text of the former edition and facilitate the use of the book

for reference purposes. The lay-out and general format have been improved and the bibliography and index have been rearranged and expanded in correspondence with the modified text.

KUHNHOLTZ-LORDAT, G.

Précis de phytogénétique. (**Summary of plant genetics**).

Masson et Cie., Paris 1952: 2000 fr.: Pp. xii + 390: 70 figs.

This well written text-book should prove of value as an introduction to genetics for university students, and will be of general interest to agriculturalists and plant breeders. The author traces the reproductive process from pollination of the stigma to the function of the gene. Whilst his theories are orthodox, the presentation of them is interesting, and quick reference is facilitated by a comprehensive table of contents.

The arrangement of topics is intended to reflect, as far as possible, the logical structure of the subject. After a preliminary definition of genetics, the author proceeds to discuss, in his introduction, vegetative and sexual reproduction, fertilization, and Mendelian theories and their importance to the plant breeder. The introduction may, in fact, be considered as a text-book in its own right.

The Mendelian theory is then expounded and the transmission of characteristics from parent to progeny discussed. The theoretical and practical aspects of the crossing of species, climatic influences on allogamy and autogamy, degeneration of species by forced autogamy and means of rectifying this are but a few of the many features presented.

The second part of the book is devoted to a study of the chromosomes and genes, and the role they play in the transmission of characteristics. Ample illustrations and diagrams serve to clarify this somewhat complex subject.

Part III deals with the non-Mendelian aspects of heredity, such as imperfect dominance, matrocliny, patrocliny and first generation segregation. Cytoplasmic heredity is also discussed in detail. The conclusion then sums up the different aspects dealt with in the book, and discusses their applicability to practical agriculturalists.

One would expect that a survey of so many topics would result in a somewhat cursory or superficial treatment. This is not however the case, the author having managed to compress a remarkable amount of relevant information into this account of the mechanics of heredity, partly because he has avoided controversial

issues. It forms a complex whole, didactic but at the same time realistic, and makes interesting reading.

In view of this it is regrettable that, in common with most French publications, the binding and general sturdiness of this book should be so poor. It will not stand up to the rough treatment to which books of reference are habitually subjected.

HERSKOWITZ, I. H.

Bibliography on the genetics of *Drosophila*. Part II.

Commonwealth Agricultural Bureaux, Farnham Royal 1952: Bibl. No. 6 of the Commonwealth Bureau of Animal Breeding and Genetics, Edinburgh: 21s: Pp. xi + 212.

The 2841 titles included in this bibliography, compiled by Dr. Herskowitz of the Department of Zoology, Indiana University, cover the years 1939 up to and including 1950, supplementing those in Prof. H. J. Muller's *Bibliography on the Genetics of DROSOPHILA*, published in 1939. In addition to genetical subjects, the list contains titles concerned with the systematics, morphology, natural history and physiology of *Drosophila*. Some references not dealing directly with *Drosophila* but thought to have relevant practical or theoretical interest are also listed, as well as a number of papers on *Drosophila* which appeared before 1939 but are not to be found in the earlier bibliography. Users of the list, which is arranged alphabetically according to authors' names, should find the general title index a fairly satisfactory guide through the jungle of voluminous literature. Except in the case of chemical mutagenesis, the list was indexed on the basis of the material provided in the titles only, a method understandable in view of the overwhelming number of papers but one which has naturally led to some inadequacies. This index also gives numerical references to titles in Prof. Muller's bibliography. A second index provides a key to papers dealing with the systematics of *Drosophila* species and the Drosophilidae. Prof. Muller contributes a preface, commenting upon the wide importance of genetical investigations on these obligingly prolific flies.

EPHRUSSI, B.

Nucleo-cytoplasmic relations in micro-organisms. Their bearing on cell heredity and differentiation.

Clarendon Press, Oxford 1953: 18s.: Pp. vii + 127: 38 figs: 3 tables.

Professor Ephrussi believes that the method of

Mendelian analysis, while it achieved amazing progress in the theory of the gene, has, possibly for this very reason, "confined our attention to the nuclear genes and thus driven us into an impasse with respect to understanding development." In his three lectures given in May 1952 at the University of Birmingham, England, under the auspices of the William Withering Memorial Lectureship, he attempted to remedy this deficiency by emphasizing some exceptional phenomena of cytoplasmic heredity. In the first lecture he describes some curious mutants which he has found in baker's yeast (*Saccharomyces cerevisiae*), one of which is devoid of a whole group of enzymes and is incapable of respiratory activity, being able to exist only by fermentation. However, these characteristics disappear entirely on crossing with a normal strain and would appear to be due to a cytoplasmic rather than a nuclear mutation. Other mutants having an identical effect prove to be gene-conditioned and by a combination of the two, lines have been obtained which are lacking in both the genic and the cytoplasmic elements required for the production of the respiration enzymes. These results are shown in the second lecture to be comparable with the killer and the antigen relationships in *Paramecium* and it is suggested that these and several related phenomena can be explained by alternative states of flux equilibria without recourse to a particulate theory of cytoplasmic inheritance. It is pointed out, however, in a significant footnote, that the precise fate of the macronuclei is an important missing element in the *Paramecium* story.

The third lecture confronts us with some further interesting results obtained by the author's colleague G. Rizet with the Ascomycete *Podospora anserina*, in which one of the two S s genes responsible for the so-called "barrage" phenomenon emerges from crosses in a modified form and is neither S nor s. Analogous results in the work of investigators with *Neurospora*, rusts and other fungi are referred to and a final attempt is made to integrate the various phenomena into a consistent theory of heredity and development, in which the cell is once more seen to be the ultimate unit of life, nuclear and cytoplasmic control being equally important, though affecting different functions. Those affected by the cytoplasm may indeed be the more fundamental processes, and mutations may only be detectable in rare cases where an alternative mechanism is available, as in the case of the nonrespiratory yeast. Evidence is even adduced which suggests that this respir-

atory mutant is an effect on the protein moiety of the molecule and that control of the basic structure of cytoplasmic proteins is a function of cytoplasmic elements.

We are grateful to Professor Ephrussi for presenting to us at this crucial stage in the development of genetics and the cognate sciences a unitary viewpoint which has, as he cogently points out, in a century of remarkable progress in the analysis of the cell and its genetic structure, been lost in the course of our advances.

DANIELLI, J. F.

Cytochemistry.

John Wiley & Sons, Inc., New York and Chapman & Hall, Ltd., London 1953: 32s.: Pp. 139; 8 figs.: 10 tables; 12 plates.

Cytochemistry is one of the newest and most fashionable of the biological sciences and one of the main objects of Professor Danielli's book is to point out some of its limitations, and explain just what can and what cannot be expected from it. This is done very forcibly in the introductory chapter. Some of the limitations can be overcome by modern techniques, notably freeze-drying, and an inexpensive apparatus for this technique has been designed by the author and his collaborators and is described in chapter 2. The third chapter is devoted to enzymes and particularly the techniques of localizing alkaline phosphatase. The author is satisfied that the sites of this can be accurately demonstrated within the cell and even within the nucleus, though more doubt is attached to its precise localization within chromosomes in normal somatic tissues. However, studies of salivary gland chromosomes seem to reveal a parallel distribution of alkaline phosphatases and DNA, though the significance of this relationship remains a matter for conjecture. The evidence suggests that alkaline phosphatase is concerned with a variety of activities and possibly represents the enzymic centre of a contractile protein, which itself may play a significant part in the shedding of gene products and in the folding of polypeptide chains into globular proteins. After a chapter on the cytochemistry of the aldehydes a further chapter is devoted to the evidence for the association between protein production and nucleic acid, leading to the suggestion that it is the nucleic acid that impresses the characteristic stamp on the polypeptide chain as it is being folded by the contraction of the chromosome protein. In addition to this function as the genetically active part of the chromosome,

one or other of the nucleic acids is also envisaged as playing a role favouring protein synthesis by combining with the newly formed proteins and removing them from the equilibrium at certain stages of active growth.

This is a stimulating book, admirably printed and presented, with some excellent photomicrographs reproduced as plates, and our thanks are due to the various public bodies, particularly the Rockefeller and Lalor foundations, which have made its publication possible.

SCHUSSNIG, B.

Handbuch der Protophytenkunde.
(Handbook of the Protophyta).

Gustav Fischer, Jena 1953: Vol. 1: DM 56: Pp. vi + 636: 198 figs.

The author's *Vergleichende Morphologie der niederen Pflanzen* appeared in 1938 and the present volume, though it is in some senses a second edition of that work, has in many ways enlarged and altered its scope. It starts with an historical outline of the study of the cell and the cytoplasm, in which existing information on the constitution of all the main elements of the protoplasm is presented, leading to a discussion of the properties of the lowest forms of living molecules such as virus, bacteriophage and gene. Each section is provided with a full and representative bibliography and this chapter alone covers the best part of 300 closely printed pages. Only then is the reader introduced to the simplest acaryotic living organisms, the bacteria and the Cyanophyceae; this section begins with a full and very objective discussion of the nature of the nuclear and hereditary phenomena in the bacterial cell before going on to an account of the different forms, many of which are illustrated by some quite excellent electron-photomicrographs.

The nucleus as such is treated only in the third chapter, which provides a very complete review of nuclear phenomena in general and in the Protophyta and Thallophyta in particular, and includes an outline of mitotic and meiotic anomalies such as those produced by colchicine and other mitoclastic substances. A certain number of additions were made comprising contributions which appeared in the course of seeing the manuscript through the press and these appear as an appendix on pp. 631-33. A second volume is in preparation; the first, now before us, is admirably printed and presented and richly illustrated and documented, which leads unfortunately to a price which will put it beyond the reach of most students, to whom the work is principally directed.

Symposium on chromosome breakage.

Oliver & Boyd, London & Edinburgh
1953: 46s.: Pp. viii + 315: figs: tables:
plates.

This symposium contains 24 contributions, grouped into four parts, dealing with radiation-induced breakage, chemically induced breakage, secondary and spontaneous breakage, and general aspects, respectively. Nine of the papers describe investigations carried out at the John Innes Horticultural Institution. With one exception, the remainder give accounts of work at the Chester Beatty Research Institute, London, and other institutes and departments in England, and also the Institute of Animal Genetics, Edinburgh.

C. D. Darlington contributes a short introduction, in which he underlines the importance of chromosome breakage as a focal problem in biology, and comments upon the advances reported by the different contributors in the analysis of the complexity of the events in chromosome breakage, from the morphological, chemical and physiological aspects. He also lays emphasis on the wider significance of studies of chromosome breakage, concluding with the challenging and anticipating statement that the conclusions of the symposium reveal the "birth of a new kind of chemistry in which the sizes of the molecules concerned have brought some of their reactions within the range of the microscope. The dimensions and directions and speeds of movement are no longer a matter of remote conjecture. They can be directly inferred. And they are taking place in the very centre of organization in the life of the cell."

In *The cytological effects of irradiation at low intensities*, the first contribution to part I, P. C. Koller describes experiments on *Tradescantia bracteata*, in which he found that the frequencies of breakage were reduced when X or Y radiation was given at low intensities. This reduction could not be attributed to increased restitution only, as suggested by Sax (cf. *PBA*, Vol. IX, Abst. 1397); the probable importance of the interaction between physiological processes and the environment in influencing chromosome behaviour is stressed.

In a discussion of fractionation experiments, G. R. Lane, in *Interpretation in X-ray chromosome breakage experiments*, also points to the necessity of taking into account both internal and environmental factors affecting the cell. The results of his further experiments on *T.*

bracteata, using a total dose of 360 r., a temperature of 24°C, fractionation periods of 10, 12 and 18 hours, and an interval of 72 hours between irradiation and fixation of metaphase, have been in agreement with the previous findings (cf. *PBA*, Vol. XXI, Abst. 2352). He therefore repeats his critical views of comparable studies by Sax and Luippold on *T. paludosa* (cf. *PBA*, Vol. XXII, Abst. 2446). The recovery in breakage frequency after a 4-hour fractionation period continued up to an interval of 12 hours. With a fractionation period of 18 hours, the breakage frequency again fell, possibly as a result of competition between restitution and reunion. The results of X-ray fractionation experiments on *T. paludosa*, described by A. Haque in "*The fractionation effect in Tradescantia*", confirm those reported by Lane.

In *The classification of radiation effects at meiosis*, C. D. Darlington and L. F. La Cour classify such effects on the basis of their X-irradiation experiments on the monocotyledons *Tradescantia bracteata*, *Fritillaria meleagris*, *F. pyrenaica*, *Lilium regale*, *Uvularia perfoliata*, *Secale cereale* with two B chromosomes, and *Luzula purpurea*. The effects are grouped into three kinds: breakage arising in the resting stage; errors of reproduction and crossing-over, determined in prophase, and capable of leading indirectly to breakage; and breakage resulting from treatment at metaphase and anaphase. The stages in cell division at which these effects become evident are clarified. In another paper, *The irradiation of meiosis in Tradescantia*, A. Haque reports his investigations of the types of breakage and reunion produced by X-ray treatment at different stages of pollen mother cell and pollen grain division in *T. paludosa*, *T. subacaulis* and *T. bracteata*. Of particular interest is the result that broken ends remained capable of reunion until prophase of the X₂ division, i.e. for a period of at least 6 days after irradiation.

L. F. La Cour, in "*The Luzula system analysed by X-rays*", presents an account of chromosome behaviour in pollen mother cells of *L. purpurea* ($n = 3$), when treated with undivided and fractionated doses of X rays. He regards the centromere system as polycentric instead of diffuse, as has been suggested by de Castro and his coworkers.

Effects of X-rays in Triticum, by J. W. Morrison, deals with experiments in which young seedlings of *T. monococcum* were irradiated. The general effect upon the mitotic cycle consisted of acceleration of prophase and retardation after prometaphase. The frequency of chromosome

constrictions at metaphase was correlated with frequency of breakage, the constrictions being classified as points of detected restitution. The occurrence of tetraploid cells and diplochromosomes is attributed to suppression of mitosis by the irradiation.

Part II begins with a paper by F. Oehlkers, *Chromosome breaks influenced by chemicals*, in which investigations by the author and his colleagues at the Botanisches Institut, Freiburg, Germany, are reviewed. Most of the research described here has already been reported in a number of papers: the survey converts the results of the important work of this team of investigators into a valuable synthesis. The chemicals employed have included methane, AlCl_3 , salts of heavy metals, alkaloids and nucleic acids. Experiments dealing with spontaneous breakage, and the action of the chemicals upon mitosis in *Vicia Faba*, and upon meiosis in *Oenothera* and other plants have shown that chromosomes contain specific regions of relatively high breakability, whether the changes are induced or spontaneous. It has moreover been possible to arrange the mutagens according to the distribution of breaks they have caused: a point of particular significance is the fact that the substances showing a distribution similar to that of spontaneous breaks are inorganic salts and nucleic acid derivatives. In numerous experiments no correlation has been found between the formation of chiasmata and the breakage and reunion of chromosomes. S. H. Revell continues with *Chromosome breakage by X-rays and radiomimetic substances in Vicia*. He has compared the type and incidence of aberrations induced in root tips by a diepoxide, di(2:3-epoxypropyl) ether, and by X rays, and finds several consistent differences. Aberrations due to diepoxide treatment occurred with a relatively higher frequency in the short than in the long chromosomes, and chiefly in visible heterochromatin; these aberrations could only be initiated during the first part of interphase. The following tentative conclusions concerning the action of diepoxide are reached: the substance acts indirectly on the chromosomes; chromosome association is a prerequisite for the induction of all types of breakage and reunion; and the induced events which produce the aberrations are homologous with those occurring in the natural process of chiasma formation. Maleic hydrazide causes breakage of plant chromosomes only in specific regions recognizable as heterochromatin (cf. *PBA*, Vol. XXI, Abst. 1576). In *The action of maleic hydrazide in Vicia*, J. McLeigh describes experiments in

which the specific action of this chemical has made it possible to define some of the space and time relations of different kinds of breakage and reunion. For example, breakage was found to be rapid, entirely within the presplit stage, and an indirect effect; the types of breakage and reunion were determined by the relative positions and mobility of broken ends, in turn dependent upon the fusion of groups of nucleolar and heterochromatic segments. Sister-reunion in broken chromatids was higher in the nucleolar chromosome arms than in the rest of the complement and was thus evidently physiologically conditioned.

G. Fahmy and M. J. Bird conclude part II with *Chromosome breaks among recessive lethals induced by chemical mutagens in Drosophila melanogaster*.

L. F. La Cour, with *The physiology of chromosome breakage and reunion in Hyacinthus*, contributes the first paper in part II, comparing the breakage-reunion sequence in cells at the first mitosis after breakage (X_1) and in cells derived from them in the X_2 and later cell generations. Occasional X_2 cells exhibited configurations arising from chromatid reunion; the interesting possibility of deferred breakage is discussed. An extranucleolar organizer with heterochromatin in a trisomic reduced apparent breakability and increased rejoinability, presumably by favouring restitution as the result of changed physiological conditions: this finding is comparable with that of McLeigh concerning the influence of the nucleolar organizer.

P. C. Koller, in *Dicentric chromosomes in a rat tumour induced by an aromatic nitrogen mustard*, gives an account of a study of a primary tumour and its transplantations, possessing the genetic property of recurrent chromosome breakage.

In *A dicentric cycle in Narcissus*, C. D. Darlington and A. P. Wylie describe the behaviour of a dicentric occurring in *N. pseudonarcissus*. Survival of the dicentric, and of the products of its breakdown, were alike dependent on the retention of a large part of the intercentric segment. This essential part was contained in the monocentric which replaced the dicentric in the fifth year. An isodicentric nucleolar chromosome occurring in a plant ($2n = 41$) of the predominantly apomictic species *Agropyron scabrum* behaved somewhat differently, as shown by J. B. Hair in *The origin of new chromosomes in Agropyron*. The dicentric, and the single or double products of its breakdown, could sustain the loss of all but a small part of the intercentric segment. This indispensable part was found in the derived short

dicentric which in the third year replaced the parental long dicentric.

In *Centromere control of chromosome splitting and breaking*, H. Rees shows that the centromere influences the distribution of anaphase errors during the primary period of disturbance subsequent to X irradiation of root tips of *Scilla campanulata*. The threshold for such errors and even for breakage in clones of this species is evidently easily reached, since both were observed to occur spontaneously in some root tips.

Synthesis of deoxyribonucleic acid in normal and irradiated cells and its relation to chromosome breakage by A. Howard and S. E. Pelc is the opening contribution to Part IV. They describe experiments in which DNA synthesis in normal cells and cells irradiated by X rays or neutrons was detected by means of P^{32} and the autoradiograph technique, using roots of *Vicia Faba* seedlings. Previous investigations by the authors have revealed that DNA synthesis occurs during interphase (cf. *PBA*, Vol. XXI, Abst. 2337). In the experiments described here, the normal mitotic cycle took 30 hours, 4 of which elapsed in division, 12 between the end of division and the beginning of P^{32} uptake into new DNA, 6 in DNA synthesis, and 8 between the end of synthesis and the prophase of the next division. The conclusion is reached that the immediate delay in entering division, resulting from irradiation, cannot be attributed to delay in DNA synthesis, and that breakage and the delay in entering division are initially independent effects. It is emphasized that more experimental work is required before the possible relationships of sensitive stage, chromosome reproduction and time of DNA synthesis can be profitably analysed.

Commenting upon the problems of deoxyribonucleic acid synthesis, in a brief paper, *Interphase synthesis of DNA in tissue culture cells*, P. M. B. Walker reports that interphase is also the period of its synthesis in chick cells.

In *Molecular orientation and chromosome breakage*, E. J. Ambrose and A. R. Gopal-Ayengar consider a number of phenomena in terms of a concept of the chromosome as a system of polymer chains. Studies of the behaviour of fresh salivary gland chromosomes of Diptera and of orientated nucleoprotein fibres, when exposed to various salt concentrations in electric fields and in reagents affecting hydrogen bonds, have suggested that the chromosomes consist of threads produced by the adhesion of anisotropic particles by means of hydrogen

bonds. Experiments on dichroism lead to the view that the salivary gland chromosomes contain macromolecules folded to a high degree in an organized manner. Data on *Ascites*, *Tradescantia* and *Psilotum* have indicated that dichroic effects are most distinct in resting nuclei, suggesting that such nuclei contain unspiralized threads similar to the individual threads of salivary chromosomes. Radiomimetic drugs, it is further suggested, probably involve blocking of certain functions of the nucleoprotein, rather than a process of direct disintegration. Finally, chromosome breakage and reunion induced by radiation and chemical mutagens are interpreted on the basis of the proposed structure of the chromosome.

In *chemical and biochemical problems arising from the study of chromosome breakage by alkylating agents and heterocyclic compounds*, A. Loveless reports that he has found no qualitative differences in the effects produced by a wide range of alkylating agents upon *Vicia* roots. Autoradiographs prepared after treatment of roots with S^{35} -labelled mustard gas revealed no evident localization of sites of reaction. The action of diepoxides in inducing abnormalities was not modified when treatment was given under conditions of mitotic arrest caused by 2:4 dinitrophenol; the effect of the former does not therefore depend upon active phosphorylation. None of the open-chain and cyclic components, consisting of derivatives and analogues of maleic hydrazide, whose action upon *Vicia* roots was tested, showed the same degree of effect as maleic hydrazide itself. The author is of the opinion that the actual mode of action of chemical mutagens cannot be profitably studied by further purely observational work on cytological changes: the more dynamic approach of biochemistry is advocated, in which breakage is a problem of nucleoprotein synthesis rather than a mechanical one.

J. R. Thoday, in *Sister-union isolocus breaks in irradiated Vicia Faba: the target theory and physiological variation*, describes how he has found that isochromatid breakage actually occurs in root-tips exposed to X or γ rays at 19°C. This evidence, and also the demonstration that the shapes of the curves relating chromatid breaks and exchanges to dose are not the result of distortion due to the effects of irradiation on rate of mitosis, support the target theory of Catcheside and Lea. This theory has however the weakness of not accounting for the effects of physiological variables, and it is now extended so that such effects are taken into consideration.

Last, but not least, L. H. Gray discusses the behaviour of aberrations induced by chemicals, ultraviolet rays and ionizing radiations, in *Characteristics of chromosome breakage by different agents*, suggesting that several, and possibly many, different forms of primary change occur, whose relative importance is determined by the physiological condition of the cell at the time of treatment and up to the final rupture.

ARNON, D. I. & MACHLIS, L.

**Annual review of plant physiology.
Volume 4.**

Annual Reviews, Inc. 1953: Pp. 453: figs.

Since physiological behaviour must be closely considered in crop improvement and is inseparable from the study of the mode of action of the gene itself, a review of this kind, containing up-to-date surveys of researches in various fields of plant physiology, performs a particularly valuable service, apart from its expected interest for the physiologists themselves. The fourth volume maintains the good standard set by the previous issues. Of the fifteen contributions, as many as eleven may be of possible interest to breeders and geneticists: Nitrogen metabolism of higher plants, by J. G. Wood; Photosynthesis, A. H. Brown and A. W. Frenkel; Organic acids in plant metabolism, R. H. Burris; Hematin compounds in plants, R. Hill and E. F. Hartree; The physiology of fruit growth, J. P. Nitsch; Physiology of root growth, H. Burström; Fluorescent substances in plants, R. H. Goodwin; The biogenesis of terpenes, A. J. Haagen-Smit; The effect of temperature on plant growth, F. W. Went; Physical properties of protoplasm, H. I. Virgin; and The plant sterols, by W. Bergmann.

The remaining four reviews consist of the following: The use of respiratory inhibitors, by W. O. James; The relation of chemical structure to biological activity in growth substances, H. Veldstra; Herbicides, A. S. Crafts; and Physiology of mycorrhizal relations in plants, by E. Melin.

TURRILL, W. B. & MILNE-REDHEAD, E. (Editors).

Flora of tropical East Africa.

Crown Agents for the Colonies, London, maps: figs.

Work on a much needed Flora of Tropical East Africa, covering the seed-bearing and vascular cryptogamic plants of Uganda, Kenya, Tanganyika and Zanzibar, was initiated at the Royal Botanic Gardens, Kew, prior to the second

world war. The work was resumed at Kew fairly soon after the end of the war, the appointment of additional staff for the preparation of the Flora being financed by a Colonial Development and Welfare Research Scheme. A further scheme in 1949 financed the cost of building a new wing to the Coryndon Museum, Nairobi, Kenya, in which is now housed the original herbarium of the former East African Agricultural Research Institute, Amani. As the foreword points out, the complete preparation of the Flora will take many years. It is "anticipated that its publication will meet not only the requirements of specialist botanists and agriculturists, but will provide also a wealth of material and information for all who are interested and concerned in the development of East Africa." The foreword, dated September 1951, gives the information that the staff at Kew, working under the Director, Sir Edward Salisbury, and the keeper of the Herbarium, Dr. W. B. Turrill, have completed the first part of the Flora. The preface published with the foreword makes clear the various practices and abbreviations followed throughout the Flora, and provides maps indicating the geographical divisions used. The Flora is to be published family by family, with separate pagination, as typescripts become ready for printing, irrespective of systematic order. Accounts of the Marantaceae, Oleaceae, Onagraceae, Ranunculaceae and Trapaceae have so far been received.

TRYON, R. M. (JUN.), DUNLOP, D. W., FASSETT, N. C. & DIEMER, M. E.

The ferns and fern allies of Wisconsin.

The University of Wisconsin Press 1953 : 2nd ed. : \$3.50 : Pp. v + 158 : 215 figs : 76 maps.

This handbook contains all the necessary information for identifying the wild Pteridophytes of Wisconsin, represented by 118 members of the Polypodiaceae, Osmundaceae, Ophioglossaceae, Lycopodiaceae, Selaginellaceae and Isoetaceae. Adequate keys and generic and specific descriptions are admirably supplemented by clear and attractive drawings and photographs of herbarium specimens and plants in their native habitats. Since the relatively limited first edition was published in 1940, the range maps have been more nearly completed by the discovery of specimens in many additional localities. Nomenclature has also been brought up to date but synonyms are still given, both in descriptions and the index, for easy reference. A short glossary and bibliography are included.

Artículos científicos publicados en América Latina 1950. (**Scientific articles published in Latin America in 1950**).

Centro de Cooperación Científica de la UNESCO para América Latina 1950 : Vol. 3 : Pp. 323.

The information presented in this compilation comprises first a list of the scientific publications from which the articles have been culled, consisting of some two hundred Argentine periodicals, 177 from Brazil and lesser numbers from the other countries of South America. The references are then presented in classified order according to the Universal Decimal Classification. The large bulk of the articles comes under medicine but a certain proportion are also included under biological and agricultural sciences. The classification is often very arbitrary, two new species of *Hordeum* appearing for instance under sylviculture; the references are sometimes incorrect, ME49 appearing on several occasions as ME119, and there are innumerable minor inaccuracies such as *court noné* for court noué, *Phytophthora impesta* for *Ph. infestans*, Hawkens for Hawkes, Borlang for Borlaug and the citation of generic names without capitals, as *solanum tuberosum* and many others. In spite of its uncommonly low standard of accuracy the work will probably serve as a useful source of information on scientific developments in Latin America.

GÄUMANN, E. A.

The fungi. A description of their morphological features and evolutionary development.

Hafner Publishing Co., New York and London 1952 : 72s. 6d. : Pp. 420 : 440 figs.

Professor Gäumann's book *Die Pilze* was reviewed in *Plant Breeding Abstracts*, Vol. XX, p. 181. The English edition which now appears has been translated and arranged as an American text by Prof. Frederick Lyle Ward of Michigan State College, USA. The long German sentences have been broken up into crisp units, which obviously makes greater appeal to an American reader, though it frequently obscures, and sometimes even alters or reverses, the logical progression of cause and effect. It may be for the sake of crispness of style again that so many of the qualifying phrases, and even question marks, are omitted—or is it that the translator does not agree with the extreme caution and precision with which Dr. Gäumann makes his statements? A certain number of factual corrections have been introduced, as well as

certain additions and omissions. In the paraphrasing of many of Dr. Gäumann's carefully and elegantly phrased remarks, however, the meaning has been so changed that one cannot but wonder whether this is really part of the process of arranging as an American text or whether in some cases it may be the consequence of inaccurate translation. Numerous instances might be cited: for example, the comparison of the Perisporiales with the Plectascales at the top of p. 141; section 3 on p. 181; the description of the perithecium and subiculum on p. 187; the expression unspecifically analogous on p. 211; the last paragraph on p. 246; the description of the successive loss of sexuality in the Holobasidiomycetes on p. 266; the rendering of *so verschmelzen die Receptaculumreste* as *the receptable axis partly disintegrates* on p. 312; and the recasting of the last sentence on p. 360 necessitated by the translation of *selbst* as *only*. The same may be said of innumerable smaller discrepancies such as the rendering of *zwei-geisselig* by *binucleate* on p. 26, *einige Kerne* by *one nucleus* on p. 95, 77 by 87 on p. 100, *Monate später* as *about a month later* on p. 112, *Pappelblätter* by *poplar leaves* on p. 114, *zäh* by *viscous* on p. 139, *evtl.* by *ultimately* on p. 143; *die Gene* by *the gene* on p. 167; *gestreift* by *omitted* on p. 175; *Milliarde* repeatedly by *million*; *so bei* by *as also* on p. 245; *Verschiebung* by *delay* on p. 266; *ebenso* by *somewhat* on p. 270; and *dabei* by *therefore* on p. 360, to quote a few at random.

The figures remain the same as in the German edition and apart from certain peculiarly American orthographic usages such as *homogenous*, *developes*, *included* and *receeds*, the volume is well printed and somewhat more attractive in appearance than the Swiss edition.

INGOLD, C. T.

Dispersal in fungi.

Clarendon Press, Oxford 1953 : 18s. : Pp. vi + 197 : 90 figs : 6 tables : 8 plates.

Since the interests of those who study fungi from a taxonomic, physiological or pathological aspect converge on the subject of dispersal, this attractive monograph can be widely recommended. Those familiar with *Spore discharge in land plants*, by the same author, will find that the lengthy chapter on spore liberation in the recent publication is a compressed and more logically arranged version of five chapters in the previous book, with many of the same excellent illustrations, most of which are drawn by the author. The high standard of this survey of structure in relation to the dynamics of spore

liberation is extended to the rest of the book, in which the actual dispersal of liberated spores is considered. A chapter on air-borne spores deals mainly with the spread of epidemic diseases among crops. Dispersal of seed-borne fungi, particularly in connexion with economic plants, is also treated separately. Other chapters are concerned with spore dispersal by insects, the larger animals and water. A terminal bibliography and an appendix, listing fungi with their authorities following the specific names, are included.

A paragraph in the preface emphasizes that the essay is not exhaustive in all respects, but this is compensated by the author's ability to convey his own intense interest and enthusiasm for the subject.

TARGIONI TOZZETTI, G.

Phytopathological classics. No. 9. True nature, causes and sad effects of the rust, the bunt, the smut, and other maladies of wheat, and of oats in the field.

American Phytopathological Society 1952 : Pp. xxiv + 139.

Giovanni Targioni Tozzetti, born in 1712 in Florence, and spending his life in an age uncramped by the intense specialization typifying our own, was a man of versatile gifts and substantial accomplishments which ranged over the whole field of natural science at that time, and indeed welled over into diverse literary and artistic activities. As Prof. G. Goidànich tells us in his biographical account, Targioni, after a swift rise to eminence in botanical studies, was appointed official physician to the Grand Ducal Court and Commissary of the Office of Health; but among his many pursuits he found opportunity to write the *Alimurgia*, the first volume of which was published in 1767. Provoked into writing this agronomical treatise by the frequent crop failures in Tuscany and other parts of Italy, he set out to analyse the causes of bad crops, and if possible to find some remedies against them, in "relief of the poor". The first volume, dealing chiefly with meteorological conditions in relation to famines, contains five parts, the final one being devoted to the study of the diseases of plants, particularly of cereals. To Prof. Goidànich goes the credit of making this study available to phytopathologists and others likely to be interested, with his 1943 edition of the original work in Italian. It has now been translated by Dr. Tehon, and presented in this addition to the series of classics published by the American Phytopathological Society.

Targioni describes, microscopically and macroscopically, often with amazingly skilful precision, the rusts and other fungus diseases of cereals; he also gives an abundance of particulars concerning the appearance and behaviour of some diseases of many other plants, mostly from observations of specimens growing in the Royal Garden of Simples and his Garden for the Repose of Aged, whither he repaired in his "few tag-ends of time". As Prof. Goidànich implies in his account of the *Alimurgia*, generally accepted attributions of a number of first discoveries in phytopathology perhaps require some revision, in the light of Targioni's fundamental contribution to early knowledge. His work has been neglected, except in Italy, after Cuboni's rescue of it from oblivion. Targioni concluded not only that rust and other diseases are due to plant parasites, existing as mycelia, but he was also certain that rust infection penetrated the host by way of the stomatal apertures, perceived that yellow and black rust of wheat are different stages of one and the same disease, and was convinced of the prime importance of meteorological conditions in infection by rust and other fungi.

An air of quaintness has been added by translating the definite article before such words as wheat, rusts, rot, smut, or dews, fogs and threshing, and before personal names such as Brandley (p. 53), which would have had the same effect if a modern Italian text had been so treated. The same applies to the preservation of a system of punctuation and word order not usual in English but not in itself associated with any archaic quality in the eighteenth-century Italian text; and to the use of words such as *thumb* rather than *inch* for *pollice*, *vegetable* rather than *plant* for *vegetale*.

DEMEREK, M.

Advances in genetics. Volume V.

Academic Press Inc., Publishers New York 1953 : \$8.50 : Pp. viii + 331.

The fifth volume in this excellent series contains six reviews, the first of which is by W. F. Blair on *Population dynamics of rodents and other small mammals*, followed by *Genetics of polymorphism in the Lepidoptera*, by E. B. Ford. A. D. Hershey, in *Inheritance in bacteriophage*, continues with a refreshingly lucid survey of researches carried out by himself and several other investigators. He deals with the biology of the bacterial viruses, methods of study, intracellular growth of bacteriophage, analysis of mutations, genetic recombination, the linkage system, heterozygosis and the viral gene.

According to the evidence so far, bacteriophages do not appear to possess anything analogous to sex, but have developed mechanisms of genetic recombination and genetic isolation that are efficient substitutes for sex. Bacteriophage particles are haploid, or at least are incapable of passing through a cycle of intrabacterial multiplication in the heterozygous condition. This limitation also seems to be circumvented by the behaviour of genetically different viruses infecting the same cell. Thus if a heat-sensitive mutant *h* of T2 and the relatively stable wild type of T2 infect the same cell, the offspring particles carrying the marker *h* possess some of the stable characteristics of the wild phenotype. This effect is not hereditary and must be due simply to the close metabolic collaboration between cell and virus and between the two forms of related virus. The phenomenon may perhaps be regarded as the functional equivalent of diploidy. Dr. Hershey's discussion of the possible nature of residual heterozygotes, consisting of resting phage particles, and of recombination is also of especial interest (cf. *PBA*, Vol. XIX, Abst. 1667 and Vol. XXIII, Abst. 5). H. Kikkawa contributes the next review, *Biochemical Genetics of BOMBYX MORI (silkworm)*. A more general survey of the genetics of the silkworm is given by Y. Tanaka, in the concluding review.

Alphabetically sandwiched between these two papers on the silkworm, G. Pontecorvo presents a full account, about 100 pages in length, of research by himself and his colleagues on the genetics of *Aspergillus nidulans*, carried out at the Department of Genetics, Glasgow University, Scotland. In the writing of some sections of the review other members of this team of investigators have cooperated, or made independent contributions. This genetical work is of particular interest since *A. nidulans* shows homothallism, a character previously considered to be too difficult an obstacle to experimental breeding. At least 18 loci have so far been identified, of which probably 7 are in one linkage group. The two loci (*bi* and *paba*) investigated for pseudoallelism have shown this phenomenon. A detailed analysis of the asci of individual perithecia has led to the discovery of relative heterothallism, of the fact that a self-fertile strain may take part preferentially in outcrossing, if given the opportunity. Strains have been obtained which carry in their vegetative cells diploid nuclei heterozygous for known markers; this success has opened up the way to a more thorough study of somatic segregation and recombination than is possible in higher

plants or animals; genetic recombination can now be studied outside the sexual cycle. The evidence available at present points to mitotic crossing-over as the cause of segregation (cf. Abst. 128 and 1725). Another important line of investigation now feasible is comparison of the physiological genetics of heterozygotes and heterocaryons in one and the same species.

BANGA, O.

Inleiding tot de plantenveredeling, speciaal van tuinbouwgewassen. (**Introduction to plant breeding, particularly of horticultural plants**).

W. E. J. Tjeenk Willink, Zwolle 1953 : bound f. 27.90 : unbound f. 26.40 : Pp.VII + 635 : figs. : tables.

The author of this textbook on plant breeding makes it clear from the start that a knowledge of the plant to be improved is the first prerequisite in successful breeding, taking pride of place even over a knowledge of the laws of inheritance, which are regarded as only one of the many sciences that can contribute to the more efficient pursuance of breeding operations. He therefore devotes the first two main chapters to questions of nomenclature and systematics, one to the International Rules of Botanical Nomenclature and the other to the problems of naming cultivated plant varieties, including the various systems that have been devised for protecting them. Questions of propagation are treated in the next two chapters, which include a general statement of the principles of floral biology in different types of plant and of the factors controlling pollination, the minimum distances for isolation and the laws governing them in the Netherlands. In discussing methods of isolation for use in breeding and in seed production, the special installations for this purpose at the Institute for Horticultural Plant Breeding at Wageningen, of which the author is Director, are described; the Institute makes wide use of insects as pollinating agents. The development of the floral primordia is described and illustrated, the factors, including photoperiodism, vernalization and grafting, which influence it, are analysed and the various methods of vegetative reproduction are described, special directions being given for avoiding the transmission of virus and other diseases through this form of multiplication. Only then is the reader introduced to the principles of genetics and cytology and their application to selection. The presentation includes discussions of such questions as the use of back crossing, the influence of sterility genes, and the

use of mutations, polyploids and heterosis. Methods of estimating yielding ability and quality are then considered and the book finishes with an outline of the general methods of plant breeding and a number of concrete examples of breeding particular horticultural plants for special features, such as an early tomato, a tomato resistant to *Cladosporium fulvum* or a strawberry combining good and regular yields with fruits of agreeable flavour, red colour of skin and flesh and ease of picking. A glossary explains the technical terms used and a combined author and subject index terminates this useful guide to horticultural plant breeding, which would well warrant translation into some other language so as to make it available to practical men and students who are not able to make use of the Dutch edition.

WHYTE, R. O., NILSSON-LEISSNER, G.
& TRUMBLE, H. C.

Legumes in Agriculture.

FAO, Rome 1953 : No. 21 : 15s. : Pp.
xiii + 367 : 34 tables : 58 plates.

With the help of over a hundred contributors, listed at the beginning, the editors survey, on a world basis, the scientific and practical information at present available on members of the Leguminosae. The study is not intended as a text book, but rather as a review of the problems agronomists and others engaged in research are now tackling in many countries. Part I contains thirteen chapters dealing with the following: the economic botany of the legumes; ecological and biotic relationships; the relation of leguminous plants to soil fertility; alternate husbandry; association with grasses; use for livestock feeding; legumes in the tropics and subtropics; toxic effects and leguminous weeds; the significance of symbiotic nitrogen fixation; plant introduction and exploration; adaptation, strain variation and breeding; investigation and testing of improved strains; and seed production. In the chapter on plant introduction and exploration, it is stressed that the possibilities of successful introduction of leguminous species have not yet been fully explored, since only recently have the particular requirements of legumes come to be better understood. In the past, insufficient attention has been given to the importance of root nodule bacteria, inoculation with appropriate strains, and soil deficiencies: legume introduction without reference to these factors is not likely to be successful. The centres of origin of the chief leguminous genera and species are defined, according to Vavilov's proposals. In emphasizing the great value of

climatic correlations in plant exploration, the view is expressed that adequate data do not yet exist; even Nuttinson's agroclimatic analogues do not really provide the full data required in planning and carrying out introduction and exploration. The chapter then cites examples of successful introductions, discusses the reliance upon local material in some countries, such as Great Britain and Sweden, and provides an account of the schemes of plant introduction in the United States and Australia. In the chapter on adaptation, strain variation and breeding, the section of about half a page in length surveying advanced breeding methods gives a disappointingly sketchy account of the progress already achieved. In the short chapter discussing the investigation and testing of improved strains, the scheme of evaluation adopted at the Welsh Plant Breeding Station, Aberystwyth, is described in some detail as an example of how to proceed in testing strains.

Part II provides useful information on the chief characters and uses of the different genera and species, and, in the case of the more important crops, also on types and varieties. The survey concludes with a bibliography, and an appendix tabulating information on the plant characters, climatic and soil adaptation and utilization of herbaceous and shrubby legumes, and also on number of seeds per pound, seeding rates and suitable spacings.

HILLS, L. D.

Russian comfrey.

Faber & Faber Ltd., London 1953 : 15s. :
Pp. 167 : 6 figs. : 4 tables : 20 plates.

Russian comfrey is another wonder plant, dear to the heart of the compost makers. If properly handled it can easily produce the hundred tons an acre referred to on the title-page of this enthusiastic book about it. Without these prerequisites it can lead to reports such as that from the Hannah Dairy Institute, who are cited as stating that "owing to its very limited value for feeding purposes and the difficulties associated with its management and utilization, it is doubtful whether its cultivation on any considerable scale would be worth while." Equally contradictory reports upon it are quoted from the farming and gardening press for over a century. This uncertainty is partly accounted for by confusion as to the species referred to; several species exist: *Symphytum tuberosum*, which is a tetraploid, is useless for fodder purposes, *S. officinale*, the most common British species, is said to be less valuable than true Russian comfrey, which seems to be a hybrid

identifiable either with *S. peregrinum* or *S. uplandicum*. In addition to this it has undoubtedly hybridized further with local species since its introduction towards the end of the eighteenth century. It is thus never certain to what plant the many reports, whether of success or failure, truly relate. By its very nature the plant seems more suitable for the small holder than for extensive cultivation; it must be reproduced from cuttings and rather carefully tended until established, it is perennial and needs very special systems of weeding to keep it clean, it needs constant cutting if it is to give the high yields quoted for it and, not being a legume, seems to require rather high manuring in order to achieve them. In consequence of all this, most research institutions have fought shy of it and most of the reports about it lack the statistical exactitude demanded by modern science. It remains therefore largely the subject of speculation and the chief merit of Mr. Hills's book is in pointing out the sources of confusion in the existing information, explaining the many possible causes of failures in the past which it should now be possible to avoid in future experiments, and in calling attention, often in very provocative and picturesque terms, to the undoubted possibilities, at least for certain special purposes, of this unusual plant, which is characterized, we are told, by "a thick-necked muscular fury—that reminds one of the sort of bull that needs watching".

CORRELL, D. S.

Section *Tuberarium* of the genus *Solanum* of North America and Central America.

Agric. Monogr. US Dep. Agric. 1952 : No. 11 : \$1.50 : Pp. 243 : 168 figs.

This important monograph describes and classifies the species in the section *Tuberarium* that occur in North and Central America, comprising more than 50 species and varieties grouped into 11 series. From mid-October 1947 to 10 January, 1948, Dr. Correll explored the mountains of south-central Mexico for indigenous tuberous species of *Solanum*: the preliminary results of his expedition have already been published (cf. *PBA*, Vol. XIX, Abst. 2653). As the season was too advanced at the time of his visit for the collection of serviceable botanical specimens, few were obtained in the field. Herbarium specimens have since been secured from tubers grown under glass at the United States Plant Introduction Garden, Glenn Dale, Md., and from tubers and seeds grown in the field at the Inter-regional Potato Introduction

Station, Sturgeon Bay, Wis. Observations have thus been made not only on plants growing indigenously in Mexico, but also under different conditions in the United States, and in a number of cases the same collection has been studied in all three environments. Herbarium specimens were prepared for comparison, whenever possible. In order to classify the material adequately, knowledge of the entire section in North and Central America was essential, entailing examination of earlier classifications and other herbarium specimens.

Dr. Correll's study of his collections under different conditions has led him to the view that many of the perplexities besetting the taxonomy of the section arise from the fact that practically all of the historically basic species, especially in the case of the tuber-bearing forms, and also a number of species described by later investigators, were founded not upon plants collected in their natural habitats, but solely upon plants cultivated in the north temperate zone, i.e. under conditions greatly different from the natural environment. The variations in plants produced from either tuber or seeds under cultivation have frequently been found to be startlingly different from the parent collections. The variations in habit have been even greater for those plants grown under glass than for those raised out-of-doors in the proper season. The behaviour of the same collection in different environments may be so widely diverse that distinct species appear to be represented, as in the case of a collection of *S. demissum* from Río Frío; the specimen in Mexico, and the plants raised at Glenn Dale and Sturgeon Bay from tubers of the same collection could well have been taken for three different species, as clearly shown by the photographs of herbarium specimens. Because of his conviction, evidently well-founded, that it is useless to describe as "new" species plants grown under cultivation in regions other than those where they are indigenous, Dr. Correll is necessarily cautious in his revision of the *Tuberosa*, the series of chief interest to breeders and geneticists. Regarding his classification as at best only tentative, he emphasizes that reexamination of the entities already composing the series as they occur in nature, and more extensive collection, are necessary before a really satisfactory basis of classification is available. In discussing the possible geographical origin of the potato, Dr. Correll is not in entire agreement with either of the main schools of thought, postulating the Andean region of Bolivia and Peru, or the island of Chiloé as the centre of origin. He

himself has not discarded the view that a fortuitous combination of characteristics derived from *S. demissum*, *S. verrucosum* and *S. stoloniferum*, all native species of Mexico, could have produced plants typical of many strains in the cultigen *S. tuberosum*. In any case, in the search for the region where *S. tuberosum*, as we have come to know it, may have grown, or may still be flourishing in a semiwild or ruderal state under the guise of a different habit, concentration upon areas with a short-day growing season is advocated. The case of *S. tuberosum* may in other respects resemble that of *S. demissum*, already mentioned. Finally, Dr. Correll pertinently suggests that an attempt should be made to find the progenitor or progenitors of *S. tuberosum* by the reverse approach, by growing in Latin America representative cultivated specimens from widely separated long-day regions throughout the world, to see if any specimen in time matched or approached any wild indigenous species. Dr. Correll's work is now being supplemented by cytogenetical investigations on his collection both in the United States and at the Max-Planck Institut, Germany.

BALLS, W. L.

The yields of a crop.

E. & F. N. Spon Ltd., London 1953 : 21s. : Pp. xv + 144 : 50 figs.

Dr. Balls is widely acknowledged for his varied and authoritative work on cotton in Egypt, and as he himself says, he has "known four and forty generations of cotton plants in Egypt rather intimately." He now gives a summing-up of the wealth of the experience of a life time in connexion with this key crop, and his data, conclusions and grave warnings concerning the main trend of cotton yield in Egypt demand careful and unbiased consideration in many quarters, unpalatable though they may be found. Originally, Egyptian irrigation was of the "basin" type; the summer flood was allowed to fill up in turn controlled areas in which, as the water was led off, a crop was sown on the drying mud. This system, however, only permitted cultivation of a summer crop of cotton, and so it was gradually converted to a regular canalized system of "perennial" irrigation. From a prodigious amount of statistical evidence, drawn from experiments at the Giza Farm and from official records, and conveniently condensed into numerous graphs and diagrams, Dr. Balls unfortunately concludes that the increased supply of water under the perennial system has led inexorably to the raising of the

level of the water-table in the Delta, with concomitant ill effects upon the growth of the cotton plant due to water-logging and other factors. Use of improved varieties developed by modern breeding, control of pests, manuring and other measures have succeeded in bringing the yield back to the neighbourhood of the old peak of 600 pounds of lint per acre obtained in 1897, some fifty years ago, but when the effects of such measures are eliminated, the yield curve for roughly the past half-century does in fact show a "relentless" downward trend, which is regarded primarily as an expression of the rise of the water-table. Thus the benefits of modern agricultural research and practice are not being realized, but are instead only masking a growing deterioration in soil conditions. Such is the stark import of Dr. Balls's thorough analysis, which can only be justifiably refuted on equally factual and cogent grounds.

Dr. Balls presents his evidence and deductions in three parts. In the first, chapters are given describing the general aspects of irrigation in Egypt, the system of irrigation in the Delta, and the behaviour of the water-table, as revealed by examination of the area covered by the Giza Farm, which is situated just above the apex of the Delta. In part II, analysing the results of experiments at the Giza Farm, he examines the way in which the yield of a cotton plant is built up, and the different factors limiting yield, viz. temperature, assimilation, water shortage, soil composition, insect pests, soil volume, rising water table and season. In his pioneering studies of cotton physiology, he has used the concept of the crop as a multiplicity of "average plants", the dimensions and attributes of the average plant being determined by measurements taken on "observation groups", suitably scattered in the field to eliminate soil variation. In the third section, Dr. Balls interprets the official statistics and records from 1882, the year of British occupation, up to and including 1947, relating yield figures with environmental conditions. In his last chapter, he enters into the thorny, complicated question of what can be done to alter the fact that the yield-capacity of the soil, for the cotton crop, is only half of what it could be, or indeed whether this state of affairs really matters in view of Egypt's strong position as a country producing the best quality cotton in the world market today, and in view of the unpredictability of the textile industry. Sceptically concluding that "no action is the most likely action", in respect of the radical irrigation reform which he believes desirable, he

nevertheless stoically suggests possible measures likely to lower the water-table in many areas of the Delta and to increase the efficiency of the water supply in other respects, and he also considers the financial aspects of reconstruction of the irrigation system. The book, dealing in detail only with cotton, has a somewhat misleading title, but it describes the use of methods of analysis which are applicable, with modifications, to yield studies, in terms of crop physiology, of other crops, whether irrigated or rain-fed.

NEGER, F. W. & MÜNCH, E.
Die Nadelhölzer (Koniferen) und übrigen
Gymnospermen. (**The conifers and
other gymnosperms**).

Walter de Gruyter & Co., Berlin 1952 :
DM 2.40 : Pp. 140 : 75 figs : 4 tables : 3
maps.

This small booklet on the gymnosperms makes an attractive addition to the Göschén series. It gives a general description of the botanical characteristics of the group as a whole, followed by accounts of the special features of the individual classes, beginning with the cycads and Ginkgoinae and followed by the main families of the conifers, the descriptions being supplemented by a number of quite good illustrations of the botanical, silvicultural and anatomical features of the species and tables for their identification according to various characteristics of wood, seed and seedling. The geographical distribution of the main species is shown in charts and the booklet is completed by a combined subject and author index.

BLASDALE, W. C.
***Cyclamen persicum*, its natural and
cultivated forms.**

Stanford University Press, California :
Oxford University Press, London : 1952
12s. : Pp. 49 : 7 figs : 7 plates.

This short illustrated monograph, by one who has grown *C. persicum* as a pastime for 20 years, gives an outline of the botanical relationships and early records of the species and describes its general morphology and distinctive features of the life history. The probable origin of the genus is discussed: the wide flat leaves suited to a temperate climate, the long-lived corm and summer dormancy have led to the suggestion that the cyclamen is a living fossil.

Reports of supposed interspecific hybridization of *C. persicum* are examined, but it is concluded that contemporary cultivated forms were developed from intraspecific crosses involving

spontaneous variants. Several distinctive strains are described. The occasional appearance of corollas with rotate instead of reflexed lobes is considered to represent atavism rather than a recent mutation.

Amateur growers may glean some valuable information from the sections on cultivation in the greenhouse and as a bedding plant in many climates.

GOWEN, J. W. (Editor).

Heterosis.

Iowa State College Press 1952 : \$5.75 :
Pp. ix + 552 : figs : tables.

In 1950, from 15 June to 20 July, a conference was organized by the geneticists of the Iowa State College, to discuss the theoretical and practical aspects of heterosis. That such a conference of American geneticists should be held in Iowa is particularly appropriate, for the indebtedness of this state to hybrid maize is well known. In the first week of the conference, the speakers dealt with the early history and development of concepts of heterosis, and with cytological research. Contributions in the second week covered physiological aspects, evolutionary problems, and specific gene and cytoplasmic effects. Meetings in the third week were concerned with postulated gene interactions, such as dominance, overdominance and recombination. Breeding systems and methods of utilizing and evaluating heterotic effects were considered during the fourth week; the conference concluded with discussions of methods of overcoming problems likely to arise in the future. This volume records the main contributions, totalling 30. The emphasis throughout is naturally on maize, but the widening approach to the whole problem is shown by contributions on fungi and bacteria, in addition to the expected ones on *Drosophila*, and also by the attention given to physiological aspects. Animal improvement, particularly pig breeding, also finds its place in this important contribution to further advances in the theoretical understanding and practical utilization of heterosis.

Zirkle, C. *Early ideas on inbreeding and cross-breeding.* (pp. 1-13).

A lively, iconoclastic discussion is given of ideas on inbreeding and crossbreeding implicit in the Greek and other early mythologies and religions. The paper continues with a brief examination of relevant botanical work carried out since the middle of the eighteenth century, and ends with an account of pre-Mendelian work on maize improvement by Beal and others.

Shull, G. H. *Beginnings of the heterosis concept.* (pp. 14-48).

The author gives details of his early experiments on the effects of self and cross fertilization in maize, the results of which led to his pioneer concept of heterosis.

Hayes, H. K. *Development of the heterosis concept.* (pp. 49-65).

Some aspects of work carried out on heterosis and its practical exploitation in both self- and cross-pollinated crops since 1910 are surveyed. Methods of breeding are examined with reference to the characters of parents and F_1 crosses in self-pollinated plants, the relation between the characters of inbred lines and those of their F_1 crosses in maize, a comparison of ways in which heterosis can be exploited in self- and cross-pollinated crops, and combining ability in maize. Genetical concepts of heterosis are also discussed.

Rhoades, M. M. *Preferential segregation in maize.* (pp. 66-80).

An abnormal type of chromosome 10 differs from the corresponding normal one by a large and chiefly heterochromatic segment of chromatin attached to the end of the long arm, and also in the chromomeric structure of the distal one-sixth of the long arm; preferential segregation occurs during megasporogenesis of plants heterozygous for the abnormal chromosome (cf. *PBA*, Vol. XIII, Abst. 167). This type of chromosome 10 is also responsible for the formation of neocentric regions, not only by this chromosome but by others. Heterochromatic knobs located on other chromosomes also appear to be concerned in the formation of precocious centric regions at both meiotic metaphases. The true or primary centromere has been found to play an essential role in the production of neocentromeres (cf. *PBA*, Vol. IX, Abst. 248 and Vol. XX, Abst. 1612). It is postulated that excess material from the true centric region passes distally along the chromosome to produce the supernumerary fibres, and that heterochromatic knobs either stimulate centric activity or cause the preferential movement of the material along the knob-bearing arms. Data on the behaviour of acentric fragments and other evidence suggest that this movement occurs after crossing-over. An hypothesis dealing with the way in which neocentric activity could cause preferential segregation is now under test.

Brink, R. A. *Inbreeding and cross-breeding in seed development.* (pp. 81-97).

The success or failure of seed development

depends primarily upon the endosperm (cf. *PBA*, Vol. XVIII, Abst. 100). The effect of the triploid condition and of heterozygosity of the endosperm upon the vigour or inherent physiological efficiency of this tissue is discussed. Experiments with *Medicago sativa* indicated that the endosperm rather than the embryo is the site of inbreeding depression (cf. *PBA*, Vol. X, Abst. 1052). The grade of seed development is not necessarily an index of the intrinsic vigour of the embryo, as exemplified by experiments on *Hordeum jubatum* x *Secale cereale* (cf. *PBA*, Vol. XV, Absts. 219 and 220) and by crosses of $2n$ and $4n$ *Lycopersicon pimpinellifolium* with *L. peruvianum*.

Whaley, W. G. *Physiology of gene action in hybrids.* (pp. 98-113).

Theories on the genetical basis of heterosis and investigations on heterosis from the aspects of seed and embryo size, early seedling growth, later development, specific growth substances and physiological characters are examined.

Robbins, W. J. *Hybrid nutritional requirements.* (pp. 114-23).

The physiological nature of hybrid vigour is analysed in relation to essential metabolites, autogenic inhibitors and other specific compounds modifying growth (cf. *PBA*, Vol. XI, Abst. 831), the effect of extracts of maize inbreds and their hybrids upon the growth of *Phycomyces Blakesleeanus* (cf. *PBA*, Vol. XIII, Abst. 163) and heterocaryotic vigour in *Neurospora*.

Anderson, E. & Brown, W. L. *Origin of corn belt maize and its genetic significance.* (pp. 124-48).

Archeological, historical, cytological and genetical evidence indicates that the open-pollinated dent maize varieties of the Corn Belt mainly originated by hybridization between the northern flints and southern dents. These two races are regarded as being so distinct that, were they wild grasses, they would be assigned to different species and possibly different genera. The hybrid vigour of Corn Belt maize appears to be largely the result of mingling of the two races. It is argued that most breeding programmes have not made the most efficient use of the heterosis of the open-pollinated varieties of the Corn Belt. It is suggested that reserves of hybrid vigour could be found in these sources, particularly among the northern flints. Morphological characters of dents and flints, if carefully chosen, should be useful criteria of combining ability. Correlations of combining ability in single crosses with the flint-dent morphological

differences of the inbred parents were significant in tests carried out for two years. The value of understanding the flint-dent ancestry of Corn Belt maize in studying variation is discussed, and illustrated by an analysis of shank type.

Buzzati-Traverso, A. A. Heterosis in population genetics. (pp. 149-60).

The evolutionary factors moulding a population, mechanisms conducive to hybridity, experiments on heterosis and the problems of analysing the basis of selective superiority of the heterozygote are discussed, mainly with reference to *Drosophila*. The importance of the study of the higher selective value or heterosis associated with the heterozygosity of a single pair of alleles is stressed and exemplified.

Smith, H. H. Fixing transgressive vigor in Nicotiana rustica. (pp. 161-74).

By selection and inbreeding, an improved, true-breeding line of *N. rustica* was developed which transgressed the best parent and also the F_1 with respect to plant height, node number and leaf length. The heritabilities of these characters were 54.9, 12.4 and 11.2%, respectively. The gains (in terms of standard deviations) due to selection were 1.74, 2.42 and 0.91, respectively. Possible explanations of the lack of direct proportionality between heritability and gain are discussed. The number of effective factors for each of the three characters was estimated to be relatively few and of the same order of magnitude. Nonisodirectional distribution of + and - genes in the parent varieties contributed to the low estimates of number of effective factors. Nonallelic interaction did not play an important part in the variation of the three characters. Reasons are given for expecting greater advances by selection and inbreeding after intervarietal hybridization in naturally self-fertilized species than by the use of F_1 hybrids.

Mangelsdorf, P. C. Hybridization in the evolution of maize. (pp. 175-98).

Interracial hybridization and interspecific crossing with teosinte, accompanied by sustained hybrid vigour, are regarded as two important factors in the evolution of maize. Races of maize in Mexico are cited as examples of interracial hybridization (cf. Abst. 1158). All the data available on yields of advanced generations of maize crosses, whether the parents are inbreds or open-pollinated varieties, tend to show that a substantial part of the F_1 hybrid vigour is retained in subsequent generations. Interspecific hybridization of maize and teosinte is occurring in Guatemala and Mexico today,

and archeological, cytological and morphological evidence has been obtained that such hybridization occurred in the past. In experimental cultures, introgression of teosinte into maize is sometimes beneficial when the teosinte genes are heterozygous, but always deleterious when they are homozygous. Preliminary data suggest that the persistence of teosinte germ plasm in maize races has been accompanied by both the development of modifier complexes and maintenance of heterozygosity.

Emerson, S. Biochemical models of heterosis in Neurospora. (pp. 199-217).

A comparison is made between the close association of heterozygous alleles of a single gene pair within a diploid nucleus and the limited interaction possible between a pair of similar alleles in different nuclei, often in unequal proportions, in the common heterocaryotic cytoplasm. Numerous instances of the expression of dominance and increased vigour, showing some resemblance to the true heterosis of higher plants, are discussed. Particular reference is made to heterocaryons between a sulphonamide-requiring mutant and either of two double mutants requiring aminobenzoic acid and homocysteine, respectively, in addition to sulphonamide. Both heterocaryons can grow rapidly, as the deficiencies of one strain are compensated by the substances synthesized by the other. Growth is not, however, maintained at a uniform rate, owing to fluctuations in the ratio of the two kinds of nuclei at the hyphal tips. Detailed studies have been made of heterocaryons between the sulphonamide-requiring strain, bearing the gene *sfo* for sulphonamide requirement, and other mutant strains bearing suppressor genes, S_1 , S_2 , S_3 and S_4 , which overcome the deleterious effect of *sfo*.

Dobzhansky, T. Nature and origin of heterosis. (pp. 218-23).

Heterosis is discussed from the aspects of (1) mutational euheterosis, in which dominant alleles with adaptive superiority protect the organism from the effects of deleterious recessive mutants; (2) balanced euheterosis or overdominance; and (3) luxuriance, a condition brought about by the complementary action of the parental genes.

Jones, D. F. Plasmagenes and chromogenes in heterosis. (pp. 224-35).

Evidence for the occurrence of mutant genes which reduce the ability of the organism to grow and survive is reviewed, with special reference to chlorophyll production in maize (cf. *PBA*, Vol. XX, Abst. 1589). Normal alleles of these

mutant genes are either completely or partially dominant, and occur in greater numbers in crossbreds than in inbreds. Back-crossing experiments with maize, in which dominant gene markers are maintained in a heterozygous condition, have shown that heterosis continues to the sixth generation, thus indicating that the chromosomal regions bearing the markers have an appreciable effect on growth. Since these regions were random selections, in respect of growth effects, it is assumed that there are a large number of genes in all parts of the chromosomes that contribute to growth without visible morphological effect.

Reciprocal crosses resulting in appreciable divergence in the amount of growth are discussed with reference to interaction between genes and the cytoplasm. Cytoplasmic pollen sterility in maize has no effect on the size of the plant, the time of flowering or the grain yield. During the conversion of standard inbreds, presumably highly homozygous, to the pollen-sterile condition, segregation of chromogenes with ability to restore pollen fertility was noted, indicating that some heterozygous potentials remain even after generations of inbreeding.

Irwin, M. R. Specificity of gene effects. (pp. 236-55).

The specific effects of genes, either contributing to a single phase of a series of successive reactions leading to the development of a phenotypic character or being in direct control of a heritable characteristic, are discussed. A detailed analysis of the specificity of genes determining the antigenic properties of the red blood cells of animals provides evidence of the direct action of a single gene on the production of the antigenic substance. In hybrids, however, the two parental genes appear to interact to produce an antigenic substance different from any detected in either parent. This hybrid substance is considered to be one of the few manifestations of heterosis among animals.

Lindegren, C. C. Genetics and cytology of Saccharomyces. (pp. 256-66).

The following topics are considered: the advantages of yeasts for genetical analysis of biochemical deficiencies; chromosomal inheritance and mapping; direct tetrad analysis; irregular Mendelian segregation; gene division; extra-chromosomal inheritance; the autonomous organelles of the yeast cell; the process of budding; and the possible role of cell constituents other than the chromosomes in inheritance. Study of irregular segregation has led to the concept of the gene as a bracelet of

catalysts arranged on the outside of the chromosome. Gene reproduction, it is argued, can be more readily explained in terms of this hypothesis than according to the concept of genes as single macromolecules arranged as beads on a string. Extrachromosomal inheritance is exemplified by the change from red coloration of colonies to white; this change does not involve genic alteration and is termed a differentiation or depletion mutation (cf. *PBA*, Vol. XVIII, Abst. 779). Reasons are given in support of the view that transmissible changes may not be confined to the chromosomes, but could also occur in other autonomous organelles, such as the nuclear membrane and centrosome.

*Plough, H. H. Genetic implications of mutations in *S. typhimurium*. (pp. 267-81).*

The percentage of both induced auxotrophic mutants and of different mutants increased with X ray dose. Most of the 20 distinct mutants obtained showed requirements for single amino-acids. A few required adenine; others showed alternative or multiple requirements. Recombination occurred between stocks with multiple requirements, but in view of its irregularity the phenomenon is regarded as possibly dissimilar from that in higher organisms. Different auxotrophs requiring cysteine or methionine formed a step-wise series, from loss of ability to reduce inorganic sulphate to loss of ability to synthesize methionine; in some cases the mutant step appeared to be associated with the inactivation of a specific enzyme. Antigenic mutants were not detected after radiation, but an auxotrophic mutant was altered antigenically by the application of the Edwards technique of passing through absorbed immune serum. No relation was found between the antigenic and auxotrophic mutant characters.

Crow, J. F. Dominance and overdominance. (pp. 282-97).

Dominance and overdominance, the two main theories advanced to explain hybrid vigour in Mendelian terms, are examined. The dominance hypothesis correlates recessiveness and detrimental effect, thus explaining the deterioration resulting from inbreeding. With hybridization, some of the detrimental recessives contributed by one parent are rendered ineffective by dominant alleles from the other, so that vigour is increased. The difficulty of accounting for hybrid vigour measurable as a significant increase over the equilibrium populations from which the parents originated is, however, emphasized. On the other hand, the alternative hypothesis assumes that at certain loci the

heterozygote is superior to either homozygote. Data presented to show that an overdominant locus has more effect on the average vigour of a population than a dominant locus also indicate that an overdominant locus has a considerably greater effect on population variance. Thus only a small proportion of overdominant loci may determine the amount of genetic variance within a population; their small number may also account for the slowness of selection.

Powers, L. Gene recombination and heterosis. (pp. 298-319).

Hybrid vigour with respect to weight per locule was noted in the F_1 of the tomatoes Porter x Ponderosa at Cheyenne, Wyo., and Woodward, Okla. In the F_2 and back cross to Ponderosa, locular weights exceeded those of the F_1 , indicating that recombination of genes had taken place, thus retaining the advantages of heterosis. Data show that for both intraallelic and interallelic interactions, genes determining weight per locule act multiplicatively, and are expressed phenotypically by dominance or heterosis according to their intensity. As the number of major gene pairs or linked groups of genes is small in this particular cross, it may be possible to select recombinants superior to the F_1 . Locular weight in the offspring of Danmark x Johannisfeuer is also determined by a few pairs of genes with major effects, but control by a large number of alleles with minor effects limits the possibility of selecting superior recombinants from Danmark x Red Currant and Johannisfeuer x Red Currant. The effects of linkage of favourable and unfavourable genes on the production of genotypes superior to those of the F_1 , with respect to characters showing heterosis, are discussed.

Mangelsdorf, A. J. Gene interaction in heterosis. (pp. 320-29).

Having realized that full use of heterosis can only be achieved by understanding the mechanism of gene action, sugar cane breeders of Hawaii have compiled a list of postulates relating to the incidence and role of unfavourable alleles and the effect of limiting factors. Special reference is made to the hypothesis of overdominance, and to the substitution of "bottle-neck" genes by more efficient alleles.

Dickerson, G. E. Inbred lines for heterosis tests? (pp. 330-51).

Reasons why ordinary dominance and epistasis must be regarded as inadequate to account for inbreeding depression and heterosis are given. Selection for heterozygote advantage is indicated only when individual and family selection

have become ineffective. The relative efficiencies of homozygous or partially inbred testers and of reciprocal selection are compared.

Henderson, C. R. Specific and general combining ability. (pp. 352-70).

In this discussion on the efficiency of selection for general or specific combining ability, methods are proposed for applying the selection index method for estimates of general combining ability in top-cross tests and for estimates of general and specific combining ability in line cross tests.

Winters, L. M. Rotational crossbreeding and heterosis. (pp. 371-77).

A summary of the results of cross-breeding pigs at the University of Minnesota provides evidence of the greater increase in vigour obtained from three-way crosses than from back-cross and single-cross progenies, in comparison with inbred lines. Rotational crossing to maintain this degree of heterosis is therefore advocated for the production of commercial stock.

Pinnell, E. L., Rinke, E. H. & Hayes, H. K. Gamete selection for specific combining ability. (pp. 378-88).

Data are presented on the single-cross performance of maize inbreds from which the hybrids Min. 406 (A 25 x A 334) (A 73 x A 375), Min. 602 (A 344 x A 334) (A 357 x A 392) and Min. 607 (A 344 x A 334) (A 357 x A 385) were derived. Low combining ability was shown by A 344 in Min. 602 and Min. 607, and by A 25 and A 73 in Min. 406, yet when these three inbreds were crossed with Morris, Golden King and Murdock, respectively, and their offspring used in place of the usual single crosses, significant increases in yield or earliness were obtained. Thus the specific combining ability of all three inbreds appears to have been improved in crosses with gametes of high specific combining ability. Comparisons of progenies of inbreds of both high and low specific combining ability crossed with the F_1 and F_2 of both A 25 x Golden King and A 73 x Murdock show that families from the F_2 segregate for combining ability. Visual plant selection within the F_2 effectively increased the yield performance of progenies derived from inbreds of low combining ability, but had no effect on yields of progenies from gametes with high specific combining ability. The practicability of visual selection among F_2 populations on a large scale is discussed.

Chase, S. S. Monoploids in maize. (pp. 389-99).

Experiments on the production of diploid homozygous stocks directly from monoploids

are described (cf. *PBA*, Vol. XIX, Abst. 2558, Vol. XXII, Abst. 2669 and Vol. XXIII, Abst. 1165). Many homozygous diploid stocks of sweet corn and dent maize, developed at Ames, Ia., are being tested for combining ability in comparison with inbred lines.

Sprague, G. F. Early testing and recurrent selection. (pp. 400-17).

Research carried out to determine the efficiency of early testing and recurrent selection in maize is reviewed. The separation of a population into two groups on the basis of combining ability is readily achieved by early testing; subsequent selection in the more desirable group yields a larger number of lines with a high combining ability than can be selected from the total population on the basis of phenotype. Although data concerning the influence of recurrent selection on combining ability are relatively limited, it is clear that this technique can be effectively used to modify the chemical composition of the maize kernel. Neither method has proved equally valuable in all circumstances, but each is recommended under certain conditions.

Wellhausen, E. J. Heterosis in a new population. (pp. 418-50).

Factors contributing to the evolution of maize in Mexico are discussed, with reference to the influence of mutation, the introduction of large-grained exotic types from the south, introgression of teosinte genes and hybridization between the many different races arising as a result of topographical isolation. Crosses between native races, made recently with the cooperation of the Mexican Government and the Rockefeller Foundation, have shown that hybrid vigour of the F_1 is often expressed only in environments different from the natural habitats of both parents. Thus it appears that heterosis depends on the relationship between the genotype and the environment as much as on the combined effect of individual genes for growth and the interaction of all genes comprising the genotype. A general report is given on the progress of the current improvement programme, which involves a wider distribution of formerly isolated open-pollinated varieties, inbreeding promising selections and top-crossing. After assessing combining ability in the S_1 , numerous high yielding three-way and double cross hybrids have been obtained from the S_1 lines. Vigorous hybrids have also been

developed from crosses between two synthetics, each consisting of closely related S_1 lines of high combining ability.

Hull, F. H. Recurrent selection and overdominance. (pp. 451-73).

Since recurrent selection for general combining ability in maize has proved less effective than had been hoped, the author was led to examine the theoretical grounds on which this procedure was based, and consequently introduced the notion of overdominance as an essential component of hybrid vigour. The present paper discusses the nature of overdominance and the practical modifications that its recognition requires in maize breeding work, in particular greater emphasis on recurrent selection for specific combining ability.

*Gowen, J. W. Hybrid vigor in *Drosophila*. (pp. 474-93).*

Hybrid vigour, observed in *D. melanogaster* in respect of egg production, is attributed to allelic genes rather than to cytoplasmic differences between the gametes. In spite of continued inbreeding, gametes are maintained in a heterozygous condition by the occurrence of lethal genes and deficiencies; thus mutations appear to be more important means of ensuring heterosis than formerly supposed. Analyses of the contributions to heterosis made by different chromosomes indicate that there are no significant interactions between the chromosome pairs; several pairs of genes per chromosome appear to be concerned with hybrid vigour. Variance analyses in hybrid populations derived from crosses between different inbreds have shown that general combining ability has a somewhat greater effect on egg production than specific combining ability. Further advantages of heterosis depend on the adaptation of the hybrid genotype to the environment.

Comstock, R. E. & Robinson, H. F. Estimation of average dominance of genes. (pp. 494-516).

A mathematical discussion is presented of the problem of estimating the average degree of dominance or overdominance of quantitative genes in experiments in which F_2 plants from a cross between two inbreds are mated at random *inter se* or are back-crossed to the inbred parents. The back-cross method appears most valuable since it gives some indication of the bias due to linkage, but it may be more biased in respect of epistasis.

INDEX

- Abdul Hamid Khan, 2824
 [Acosta C., A.], 2502
 Adair, C. R., 2728
 Addens, N. H. H., 2508
 Adelberg, E. A., 2393
 [Afanasyev, M. M.], 2867
 Afifi, A., 2599
 Ageev, A., 3005
 [Aguirre, S., C.], 2502
 Ahmad, M., 2449, 2451, 2453
 [Alban, E. K.], 2518
 Alcaraz Mira, E., [2869], 2875
 Alexander, D. E., 2649
 Allard, R. W., 2322, 3106
 Allison, J. L., 2767
 Almeida, J. L. F., de, 2983
 Andersen, T., 2628
 Anderson, E., 2966, 3125 [p. 669]
 Anderson, J. A., 2580
 Andersson, G., 2893
 Andrew, R. H., 2660
 Angulo Busquets, M., 2636
 Angulo Carpio, M. D., 2979
 [Anson, R. R.], 2817
 Argikar, G. P., 3090, 3121
 Armitage, P., 2392
 Arnborg, T., 2994
 [Arnold, M. H.], 2817
 Arnon, D. I., p. 661
 Artouzoul, J., 2989
 [Artschwager, E.], 2867
 Asuyama, H., 2515
 Atkins, I. M., 2667
 Atkins, R. E., 2612
 Ávall, H., 3016

 Badina, G., 3100
 Bahtadze, K. E., 2885
 Balasubramanian, R., 2829, 2831
 Baldini, E., 3039
 Baldoni, R., 2657
 Ballatore, G. P., 3094
 Ballentine, R., 2426
 Balls, W. L., p. 667
 Banga, O., 3025-6, p. 664
 Banks, H., 2350
 Baptist, E. D. C., 2918
 Barkulis, I. L., 2406
 [Barlow, K. C.], 2817
 Barnett, H. L., 2458
 Barreiros, H. A., 2727
 Barrett, H. C., 2988
 Barton, D. W., 3119
 Barton, L. V., 2506
 Basse, H., 3014
 Batra, S., 3049
 Bauch, R., 2360
 Bauman, L. F., 2649
 [Bauserman, H. M.], 2867
 Baxter, J. W., 3127
 Beachell, H. M., 2728
 Beddows, A. R., 2745
 Bergelin, E., 2974
 Berger, H., 2410, 2413
 [Berger, R. E.], 2345
 Berger, W., 2998

 Behr, L., 3104
 Bermejo Zuazúa, A., 2544
 Bernarr, J., 2538
 Betz, R. F., 2450
 Bevan, E. A., 2428
 Bever, W. M., 2620
 Bianchi, A., 2573, 2750
 Bidabe, B., 2536
 [Bieseke, J. J.], 2345
 Billen, D., 2409
 Bingham, R. T., 3012
 Bishop, C. J., 2937
 Bisset, K. A., 2402-3
 Bisson, J., 2987
 Black, F. L., 2459
 Blasdale, W. C., p. 668
 Boerger, A., 2517
 Bogdanov, V. M., 2440
 Bøgh, H., 2488
 Bohn, G. W., 3051
 Bolsunov, I., [2869], 2872-4, 2880
 Bonner, J., 2949
 Bonnett, O. T., 2620
 Borenius, S., 2330
 [Borlaug, N. E.], 2502
 Bose, R. C., 2297
 Bowman, D. H., 2616
 Bowman, G. F., 2889
 Box, B. E. P., 2296
 Boyce, S. W., 2849
 Boyce, W. R., 2850
 [Brieger, F. G.], 2502
 Briggs, F. N., 2322
 Brilling, S., 2387
 [Brink, R. A.], p. 669
 Brock, R. D., 2763
 Broekhuizen, S., 2591
 Brooks, R. M., 2922
 Brown, C. H., 2821
 [Brown, R. J.], 2867
 [Brown, W. L.], p. 699
 Brown, W. N., 3122
 Brücher, H., 2778, 3097
 Bryson, V., 2407
 Buchholz, E., 2992
 Bunting, M. I., 2395
 Burbidge, N. T., 2746
 Burkart, A., 3097
 [Bush, H. L.], 2867
 Butler, E. E., 2417
 Buzzati-Traverso, A. A., 2323
 [p. 670]
 Bylda, A. Z., 2948

 Cain, A. J., 2333
 Calma, V. C., 3111
 Câmara, A., 2356
 Camien, M. N., 2404
 [Campbell, S. C.], 2867
 [Cantillon, P.], 2476
 [Cárdenas R.], 2502
 [Caridad Igelmo, J. M.], 2869
 Carles, J., 2658
 Carlone, R., 2935
 Carouso, N., 2412
 Carpenter, T. R., 2942

 [Carrillo A., F.], 2502
 Carson, H. L., 2375
 Carvajal, F., 2416
 [Castillo C., F.], 2502
 Castro, D., 2366
 Catlin, B. W., 2396-7
 Černov, P., 3112
 Chamblee, D. S., 2767
 Chandra Das, B., 2768
 Chandraratna, M. F., 2717
 [Chase, S. S.], p. 672
 Chatterjee, B., 3089
 Chatterjee, B. G., 2882
 Chatterjee, D., 2813
 Chavency, A., 2912
 Chayen, J., 2341, 2344, 2349
 Chevalier, A., 2914, 2931
 Chevalier, R., 2535
 Chiappelli, R., 2724
 Chinoy, J. J., 2927
 Christen, H. R., 2972
 Christensen, M., 2808
 Christman, R. C. (Editor), p. 654
 Cicin, N. V., 2650, 3076
 [Clake, M.], 2345
 Clarke, M. F., 2737
 Cleary, J. W., 2910
 Cochran, L. C., 2944
 Cochran, W. G., 2292
 Coe, G. E., 2372
 Coelho, C., 2856
 Coleman, O. H., 2698
 Comstock, R. E., 2630 [p. 673]
 Conger, A. D., 2367
 Connors, I. L., 2594
 Conover, R. A., 3084
 [Coons, G. H.], 2867
 Cooper, J. F., 3082
 Cooper, J. P., 2739
 [Corman, C. E.], 2867
 Correll, D. S., p. 666
 Corriols, J., 2690
 [Cortázar Sagarmínaga, R.], 2502
 [Cota Galán, R.], 2869
 Coutinho, L. de A., 3351
 Cowgill, W. H., 2916
 Cox, D. R., 2299
 Cram, W. H.,
 [Crandall, B. H.], 2867
 Crane, M. B., [2464], 2939
 Crane, P. L., 2643
 Crescimanno, F. G., 2961
 [Crow, J. F.], p. 671
 Crowder, L. V., 2740
 Cruickshank, I. A. M., 2908-9
 [Cuany, R. L.], 2817
 Culaja, V. I., 2952
 Cummins, G. B., 3127

 Daday, H., 2759
 [Dahlberg, H. W.], 2867
 Dakshinamurti, C., 2882
 Dallyn, S. L., 3092
 D'Amato, F., 2364
 Danielli, J. F., p. 657
 [Dark, S. O. S.], 2894

- [Darlington, C. D.], 2464
 Darrow, G. M., 2975
 Datta, R. M., 2842
 David, F. N., 2294, p. 655
 Davidson, T. M. W., 2786
 Davis, L. L., 2304
 Davis, R. L., 2753-4
 De Bruyn, P. P. H., 2350
 [De Cillis, U.], 2530
 de Crel, B., 2588
 de Posseux, G., 2588
 de Groot, P. W., 2783
 den Hartog, G. T., 2677
 DeLamater, E. D., [2345], 2401
 de Larambergue, R., 2529
 Delone, L. N., 2590
 [Del Valle, C. G.], 2502
 Demarly, Y., 2731
 Demerec, M., p. 663
 de Mol van Oud Loosdrecht, W. E., 2314
 Deo, K. G., 2832
 Desjobert, G., 2911
 de Sornay, A., 2859
 [De Vilmarin, M.], 2530
 de Willigen, A. H. A., 2783
 Deysson, G., 2380, 2382
 [Dickerson, G. E.], p. 672
 Dickson, A. D., 2670
 Diehl, R., 2543
 Diemer, M. E., p. 661
 Dikshit, N. N., 3040
 Diwakaran, K., 2692
 Dobrovoljskii, A. N., 2984
 [Dobzhansky, T.], p. 670
 Domingo, W. E., 2903
 Donovan, P. A., 2603
 Douwes, H., [2817], 2828
 [Downie, A. R.], 2867
 [Doxlator, C. W.], 2867
 Drain, B. D., 2973
 [Duarte R., E.], 2502
 [Dubow, R. J.], 2345
 Duckart, W.-J., 2514
 [Ducker, H. C.], 2817
 Dudley, R., 2463
 Duffield, J. W., 3012
 [Dunham, R. S.], 2518
 Dunlop, D. W., p. 661
 Dunn, G. M., 2659
 Dunn, M. S., 2404
 Durand, C., 2339
 Durquety, M., 2987
 Dutt, M., 2363, 2915
 Dyke, G. V., 2302
 Dzjubenko, L. K., 2654
 Ehrenberg, L., 2330
 Eken, C., 2505
 Eliasson, S., 2689
 Elder, A. H., 2585
 Eldredge, J. C., 3126
 [Elgueta, M.], 2502
 Ellenby, C., 2799
 Ellenwood, C. W., 2932
 Ellison, J. H., 2791
 [Emerson, S.], p. 670
 Emilsson, B., 2792
 [Encisco, C. T.], 2502
 Ephrussi, B., 2391, p. 656
 Erickson, R. O., 2346
 Esser, K., 2379, 2605
 Estrada Ramos, N., 2777, 2789
 Farr, R. S., 2350
 Fassett, N. C., p. 661
 Favorov, A. M., 2790
 Fedin, A. H., 2780
 Félix, L., 2731
 Ferguson, H. S., 2863
 Fernandes, A., 2355
 Ferreira, A. do N., 2550
 [Fife, J. M.], 2867
 Finch, C. G., 3044
 Findley, W. R. (Jun.), 2640-1
 Finkner, R. E., 2612
 Fischer, F., 3008
 Fischbeck, G., 2613
 [Fischer, G. J.], 2502
 Fischer, G. W., 2734
 Fisher, R. A., 2295
 Fokeev, P. M., 2586
 Forlani, R., [2530], 2574, 2561, 2563, 2573-4, 2750
 Fowler, R. E., 2890
 Fraser, R. D. B., 2344
 Frederiksen, P. S., 2839
 [Freeman, G. H.], 2923
 Freitas, A. P. do C. e., 2637
 Frey, K. J., 2621
 Friant, R. J., 2642
 Friedrich, G., 2946
 Frolov, P. V., 2901, 2906
 Furutani, Y., 2450
 [Gacitúa L-R., H.], 2502
 [Gadea, M.], 2530
 Gadet, R., 2658
 Gagnieu, A., 2357
 Galinat, W. C., 2660
 Galletta, G. J., 2975
 Gamova-Kujukova, N. I., 2436
 Garber, E. D., 2412
 Gardé, A., 2376, 2744
 Gardner, C. O., 2630
 [Garner, R. J.], 2923
 Gardner, E. J., 3086
 [Gaskill, J. O.], 2867
 Gattani, M. L., 2422
 Gäumann, E. A., p. 662
 Gautheret, R. J., 3033
 Gelin, O. E. V., 2673
 Gerola, F. M., 2386
 Ghosh, P. N., 3061
 Gibson, P. B., 2760
 Gilbert, J. C., 3085
 Giral, J., 2648
 Globa-Mihaïlenko, D. A., 3000
 [Gökgöl, M.], 2530
 Gokhale, V. P., 2596
 Golubinskii, I. M., 2929
 Gončarik, M. N., 2787
 [Goode, P. M.], 2923
 Gould, F. W., 2742
 [Gowen, J. W.], p. 673
 [Graça, L. Q.], 2530
 Grado, A. de, 2527
 Graeber, W., 2633
 Graham, T. G., 2729
 Grandjean, F., 2326
 Granhall, I., 2330
 [Grégoire, M.], 2530
 Grente, J., 2959
 Griesbeck, A., 2389
 [Grifoni, E.], 2530
 [Grillot, G.], 2530
 Grobbelaar, W. P., 2639
 Grogan, C. O., 2647
 Groman, N. B., 2414
 Grundy, P. M., 2301
 Guimbard, C., 2588
 Guiolet, J., 2531
 Gulati, K. C., 2882
 Gustafsson, N., 2792
 Gutierrez, M. G., 2646
 Guyot, L., 2537
 [Guzmán, V. L.], 2502
 Haas, F. L., 2410, 2413
 Haas, H. J., 2538
 [Hac, L. R.], 2867
 Hackbarth, J., 2770
 Hadders, G., 2994
 Hadley, H. H., 2696
 Hagberg, A., 2624
 Hagiwara, T., 2899
 Hagiya, K., 3029, 3032
 Haigh, J. C., [2462], 2795
 Halifman, I. A., 2507
 Haltiwanger, W. L., 2642
 Hamilton, R. A., 2963
 Hamson, A. R., 3081
 Hanson, C. H., 2766-7
 Hara, S., 2709
 Harmon, F. N., 2986
 [Harrar, J. G.], 2502
 [Harris, R. V.], 2923
 Harshbarger, B., 2304
 Harte, C., 2321
 Hartmair, V., 2775
 Hartshorne, J. N., 2317
 Harvey, P. H., 2630
 Haskew, H. C., 2865
 Hassebrauk, K., 2595
 [Hastie, M. S.], 2817
 [Hawkes, J. G.], 2502
 Hayase, H., 3060
 Hayashi, K., 2718
 [Hayes, H. K.], p. 669
 Hayman, B. I., 2311
 Hedou, J., 2804
 Hedrick, L. R., 2450
 Heidrich Sob., E., 2545
 Heinen, A., 2531
 Heinisch, O., 2307
 Heinrich, H. C., 2387
 [Henderson, C. R.], p. 672
 [Hernández Xolocotzi, E.], 2502
 Herskowitz, I. H., p. 656
 Hey, A., 2796
 Heyne, E. G., 2597
 Hiesey, W. M., 2735
 Hikenbäumer, F., 2928
 Hill, H., 2387
 Hill, R. G. (Jun.), 2977
 Hills, L. D., p. 665
 Hintze, S., 3015, 3024
 Hirayoshi, I., 2765
 Hirayoshi, K., 2712
 Hirsch, H. M., 2431
 Hirschhorn, E., 2456
 [Hitchcock, M. M.], 2923
 [Hoblyn, T. N.], 2923
 Hodjko, L. E., 2757

- Hoffman, J. C., 3099
 Holden, C., 2346
 Hollaender, A., 2409
 Holton, C. S., 2455
 Hopp, H., 2916
 [Horne, F. R.], 2462
 Horovitz, S., 2905
 Hosoda, T., 3028
 Hösslin, R. v., 2774
 [Hotchkiss, R. D.], 2345
 Houston, B. R., 2686
 [Howard, A.], 2345
 Hudjak, M. I., 2337
 Hugh, R., 2394
 [Hughes, L. C.], 2817
 Huijsman, C. A., 2800
 [Hull, F. H.], p. 673
 [Hunter, M. E.], 2345
 Husfeld, B., 2981
 Hutchins, A. E., 3058
 Hutchinson, J. B., 2610, [2817]
 [Huter, R.], 2869
 Hutton, E. M., 3087
 Huttunen, E., 2606
 Hylmö, B., 2976
 Hyun, S., 2958

 Ichinohe, M., 3109
 Ierusalimskii, N. D., 2433
 Igonin, I., 2913
 Iizima, T., 3053
 Iizuka, M., 2383
 Imšeneckii, A. A., 2420, 2438, 2442
 Ingold, C. T., p. 662
 Inoué, S., [2345], 2359
 Irvine, G. N., 2580
 [Irwin, M. R.], p. 671
 Islam, A. S., 2955
 [Izquierdo Tamayo, A.], 2869
 Izbitskii, H., 3112

 Jackson, A. A., 3038
 Jacobson, G., 2689
 Jacobson, W., 2365
 [Jacometti, G.], 2530
 Jacquard, P., 2553
 Jagannatha Rao, C., 2820
 Jähnl, G., 2773, 2809
 Jakubciner, M. M., 2589
 Jamalainen, E. A., 2513
 [James, R. W.], 2817
 Jenkins, J. A., 3071
 Jessop, W. N., 2293
 Jodon, N. E., 2711, 2728
 Johnson, I. J., 2769, 3126
 Johnson, J. C., 3105
 Johnson, N. L., 2294
 Johnson, R. T., [2867], 2868
 Johansson, E., 2974
 Johnsson, H., 2996
 [Jolly, G. M.], 2923
 Jonard, P., 2588
 [Jones, D. F.], p. 670
 Jones, H. A., 3034
 Jones, J. W., 2728
 Jones, K., 2745
 Josephson, L. M., 2639
 Joyce, G., 2403
 Jünger, R. W., 2632, 2649

 Kadam, B. S., 2879
 Kanapaux, M. S., 3099

 Kanér, R., 2971
 Kanie, M., 2421
 Kaplan, R. W., 2331
 Kaplan, S., 2407
 Kappert, H., p. 655
 Kartamyšev, V. G., 2680
 Katayama, Y., 2710
 Kawase, T., 2718
 Kazi-Zade, F. N., 2941
 Keller, C., 2684
 Keller, K. R., 2896
 Kelly, A. F., 2618-9
 Kelner, A., 2400
 Kemmer, E., 2933
 Kennerly, A. B., 3035, 3063
 Kent, N. L., 2610
 Kerguelen, M., 2731
 Kesava Iyengar, N., 2829
 Kester, D. E., 2960
 Keuls, M., 3025-6
 Keyworth, W. G., 2897-8, [2923]
 Khan, A. H., *see* Abdul Hamid
 Khan
 Kibalov, P. I., 2982
 Kiellander, C. L., 3009, 3011
 Kihara, H., 2567
 Kimura, M., 2316, 2318
 [King, H. E.], 2817
 King, N. J., 2862
 Kirjälä, E. N., 2437
 Kjaer, A., 2701
 Klein, L. G., 2936
 Klinkowski, M., 3104
 Knjazeva, R. N., 2757
 Knight, C. A., 2459
 Knight, R. L. [2817], 2823, 2834
 Knight, W. E., 2762
 Koblet, R., 2490
 Kočotov, S. P., 2934
 Koenig, J., 2531
 [Koenig, P.], 2869
 Köhler, E., 2806-7
 [Kohls, H. L.], 2867
 Koller, J., 2600
 Komatsu, J., 2825
 Kopf, K., 2629
 Koptev, G. S., 2501, 2906
 Kornilov, A. A., 2533
 Korsten, L. H. J., 2756
 Kostjuk, M. D., 2950
 Koyama, N., *see* Hyun, S.
 [Kozloff, L. M.], 2345
 Krahel-Urban, J., 2995
 Kramer, H. H., 2659
 Krasnjuk, A., 2627
 Kress, H., 2771
 Krickl, M., 3031
 Krishna Rao, P., 2692
 Krishnaswamy, N., 2695
 Krishnaswamy, V., 2692
 Kruskal, W. H., 2309
 Kucerjavyh, E. G., 2950
 Kudaševa, R. F., 2920
 Kuhnoltz-Lordat, G., p. 655
 Kumar, L. S. S., 2381
 Kump, M., 2681-2
 Kunin, C., 2426
 Kuperman, F. M., 2504
 Küppers, H., 2946
 Kupperts, J. R., 2892
 Kuriyama, H., 2714

 Kurnick, N. B., 2348
 Kusatz, H., 2511
 Kuwada, H., 2844-8
 Kvasnikov, E. I., 2398, 2434

 La Belle, R., 2936
 Labrum, E. L., 2395
 [Lacroix, L.], 2476
 Laguna, J., 2648
 Lal, K. B., 2837
 Lamb, K. P., 3023
 Lambert, J. W., 2677
 Lamm, R., 3016
 Lamprecht, H., 3114-8
 [Landi, R.], 2530
 Langlet, O., 3010
 Langner, W., 3007
 Lardy, A. C., 2545
 Laričeva, M. D., 2570, 2626
 [Larose, E.], 2476
 Larroque, P., 2503, 2905
 Larsson, G., 3017
 Lasser, E., 2525
 Lattanzi, A., 2871
 Laubscher, F. X., 2639
 Lawley, D. N., 2786
 [Lawrence, W. J. C.], 2462
 LeBeau, F. J., 2698
 Le Corre, P., 2804
 Lechner, L., 2764
 Leffell, R. C., 2736
 Le Hir, J., 2804
 Leifson, E., 2394
 Le Lann, P., 2804
 Lenskii, M. A., 3005
 Leopold, U., 2391
 Lepesinskaja, O. B., 2336
 Lesins, K., 2749
 Lesley, J. W., 2949, 3075
 Lesley, M. M., 3075
 Lewin, R. A., 2315
 [Lewis, D.], 2462, 2464
 Lindgren, C. C., 2429, [p. 671]
 Linnert, G., 2370, 2377
 Littler, J. W., 2729
 [Lochrie, J. V.], 2817
 Locke, L. F., 3083
 [Loegering, W. Q.], 2502
 Loginova, L. G., 2439
 Lollichon, F., 2876
 [Long, M. L.], 2867
 Longwell, J. H., 2494
 Loraine, P. K., 2300
 Love, H. T., 2916
 Lubisich, T. M., 2585
 Lučić, S., 2598
 Lucke, W. H., 2446
 Luong Dinh Cua, 2716
 [Lutri, I.], 2530
 Lynch, P. B., 2810, 2840
 Lysenko, T. D., 2532

 M-L., H., 2861, 2864
 McCain, F. S., 2697
 McCann, L. P., 2843
 McCollum, J. P., 3098
 [MacDonald, D.], 2817
 [McFarlane, J. S.], 2867
 MacGillivray, J. H., 3022
 McGuire, D. C., 3080, 3085
 Machlis, L., p. 661

- McKee, D. W., 2452
 McKelvey, J. J., 2502
 McKibben, G. E., 2620
 Mackinney, G., 3071
 McMillan, C., 3003
 Makarovskii, A. F., 3048
 Malcolm, J. P., 2683
 [Maliani, C.], 2530
 [Mangelsdorf, A. J.], p. 672
 [Mangelsdorf, P. C.], p. 670
 [Manning, H. L.], 2817
 Manolov, I., 2478
 Manunta, C., 3068–9, 3073
 Mao, Y. T., 2632
 Marar, K. S., 2820
 Marchand, H., 2327
 Maree, H. J., 2551
 Marks, E., 2939
 Marks, G. E., 2980
 Martin, H. F., 2610
 Martin, J. H., 2693
 [Martínez B., J. J.], 2502
 Mascré, M., 2380, 2382
 Masima, I., 2838
 Massenot, M., 2537
 Matsumoto, M., 2725, 2765
 Matsumura, S., 2557–8
 Matthews, J. D., 2991
 Maury, P., 2658
 Mayer, R., 2588
 Mazoti, L. B., 2652
 Mazzani, B., 2905
 Mecham, D. K., 2585
 Meiners, J. P., 2734
 Melhus, I. E., 2980
 Mello-Sampayo, T. J., 2366, 2562, 2713, 2715
 Menezes, O. B. de, 2964
 Messer, P. J., 2419
 Meyer, K., 2388
 Milbrath, J. A., 2943
 Miles, S. R., 2643
 Miller, J. C., 3092
 Mills, W. R., 2794
 Milne-Redhead, E., p. 661
 Minabe, M., 2812
 Miravalle, R. J., 2910, 3113
 [Modlibowska, I.], 2923
 [Moës, A.], 2476
 Moiseenko, L. F., 2441
 [Montellano, P.], 2502
 Moore, R. C., 2970
 Morinaga, T., 2704, 2714
 Morris, E. O., 2403
 [Morris, H. E.], 2867
 Morthland, F. W., 2350
 [Moses, M. J.], 2345
 Mota, M., 2373
 Mudd, S., [2345], 2401
 Mukasa, K., 3109
 Mukherjee, S. K., 2956
 Müller, H. J., 3095
 Müller, K. O., 2795
 Multamäki, K., 2384
 Münch, E., p. 668
 Mundkur, B. D., 2443
 [Muñoz, J. M.], 2502
 [Munro, J. M.], 2817
 [Murphy, A. M.], 2867
 Murphy, H. C., 2612
 Myers, J. W., 2393
 Nagamatsu, T., 2555, 2706
 Nagamatu, T., *see* Nagamatsu, T.
 Nagao, S., 2707–8, 3060
 Nagbiswas, S. C., 2813
 Naik, K. C., 2924
 Nair, K. R., 2305
 Nakajima, G., 2568, 2622
 Nakasone, H. Y., 2963
 [Namazie, J.], 2867
 Nara, S., 3059
 Narain, A., 2902
 Narita, G., 3027
 [Narváez M., I.], 2502
 Nauriyal, J. P., 2953
 Nazarova, M. Z., 3076
 Neal, C. W., 2642
 Neger, F. W., p. 668
 Neky, E., 2540
 Nelder, J. A., 2310
 Nelson, O. E. (J.), 3070
 [Nelson, R. T.], 2867
 Nenašev, V. V., 2788
 Neptune, G., 2661
 Nevzorov, V., 2907
 Newcombe, H. B., 2415
 Newhook, F. J., 2850
 Newman, J. E., 2643
 Nicholson, G., 2546
 [Niederhauser, J. S.], 2502
 Niizeki, H., 2674, 2705
 Nikitenko, G. F., 2671
 Nilsson, F., 3024
 Nilsson-Leissner, G., p. 665
 Nishikawa, M., 3110
 Nishimura, Y., 2674, 2705
 Nishiyama, I., 2369
 Nitta, K., 3108
 Noble, K., 2412
 Nohe, E., 3019
 Norman, A., 2425
 Norris, K. P., 2341
 North, B., 3070
 North, C., 3041, 3043
 Nötzel, H., 2669
 [Noulard, L.], 2476
 Nuffer, M. G., 2631
 Oberle, G. D., 2970
 [Ochoa, R. E.], 2502
 Ogur, M., 2346
 Oinuma, T., 2672, 3088
 [Oldemeyer, R. K.], 2867
 Oldén, E. J., 2938
 Olesen, O. J., 3021
 [Ollero Gómez, A.], 2869
 Olmo, H. P., 2922
 Ono, T., 2893
 Onufrijchuk, T., 2547
 Omura, Y., 2899
 Oomura, Y., *see* Omura, Y.
 Oort, A. J. P., 2793
 Oswald, J. W., 2686
 Ota, Y., 2705
 Owen, A. R. G., 2328–9
 [Owen, F. V.], 2867
 Paatela, J., 2522
 Paci, C., 2650
 [Paéz, J.], 2502
 Pakudin, Z., 2467
 [Palacios, R.], 2502
 [Palacios de la Rosa, G.], 2502
 Palmer, T. P., 2571, 2776
 Panov, I., 2741
 [Papadimitriu, P.], 2530
 Paquet, J., 2536
 Parham, B. E. V., 2891
 Parodi, L. R., 2733
 Pasečnik, I. P., 3079
 Pastušenko-Strelec, N. A., 2625
 Patel, G. I., 3062
 Patil, B. P., 2596
 Patil, J. A., 2691
 Patterson, C. F., 2781
 Patterson, H. D., 2302
 Payne, T. L., 2826
 Peak, A. R., 3087
 Pearce, S. C., 2298, [2923]
 Pearson, C. H. O., 2855
 Pearson, P. B., 2313
 [Peat, J. E.], 2817
 Pedersen, M. W., 2751
 Peive, J., 2468
 Peive, J., *see* Peive, J.
 [Pelc, S. R.], 2345
 Pendleton, J. W., 2620, 2644
 Penfold, A. R., 2999
 Perkins, D. D., 2320
 Perkins, D. Y., 3092
 Perlasca, G., 3037
 Perova, K., 2420
 [Perucci, E.], 2869
 Pesola, V. A., 2548
 [Peters, R. W.], 2817
 [Peterson, D. F.], 2867
 Peterson, L. C., 2794
 [Peto, F. H.], 2867
 Pfeiffer, R., 2540
 Piacco, R., 2702
 [Pielen, L.], 2466
 Pierson, C. F., 3064
 [Pinnel, E. L.], p. 672
 Plant, W. S., 2655
 [Plough, H. H.], p. 671
 Plumet, H., 2536
 Poehlman, J. M., 2607
 Pohjakallio, O., 2423
 [Pollister, A. W.], 2345
 Pomper, S., 2452
 Ponchet, J., 2600
 Poole, C. F., 3046
 Popow, G., 2554
 Porter, J. W., 3077
 Posjavin, A. T., 3050
 [Powers, L.], p. 672
 Prahlada Rao, L. S., 2444
 Prakash, R., 3089
 Prasad, A., 2319
 Prell, H., 2378
 [Preston, A. P.], 2923
 [Price, C.], 2867
 Prochazka, F., 2748
 Prokofjev, S. D., 2968
 Pruckova, M. G., 2587
 Purnendu Mohon Roy, 2306
 Pushkarnath, 2798
 [Putnam, F. W.], 2345
 Quackenbush, F. W., 3070
 Quantz, L., 3096
 Radhakrishnamurthy, B., 2879
 Ramamoorthy, B., 2882

- Raman, V. S., 2695
 Rao, N. S., 2842
 Raut, C., 2448
 Rebischung, J., 2731
 Reeder, J. R., 2732
 Reese, G., 2358
 Reeve, E. C. R., 2312
 Reeves, J., 2593, 2604
 Reiterer, M., 2634
 Relander, E., 2423
 [Rhoades, M. M.], p. 669
 Richharia, R. H., 2319, 3061
 [Rinke, E. H.], p. 672
 Rjabčenko, I. M., 2435
 [Robbins, W. J.], p. 669
 Robert, A. L., 2457
 [Roberts, L. M.], 2502
 Robinow, C. F., 2399
 Robinson, B., 3022
 Robinson, H. F., 2630 [p. 673]
 Rodionov, A. P., 2951
 Rodrigues, A., 2985
 [Rogers, W. S.], 2923
 Rogler, G. A., 2538
 Rønde Kristensen, H., 2808
 Ronningen, T. S., 2761
 Rosario, C. V., 3111
 [Rose, M. F.], 2817
 Rosen, G. U., 2346
 Rosenblum, E. D., 2407
 Rosenstiel, K. von, 2609
 Ross, H., 2803, 2805–6
 Rossman, E. C., 2645, 2661
 Rowell, J. B., 2417
 Roy, P. M., *see* Purnendu Mohon Roy
 Rozsa, G., 2342
 Rubin, B. A., 2390
 [Rudorf, W.], 2466
 [Rupert, J. A.], 2502
 [Ruxton, J. P.], 2923
 Ryan, F. J., 2426
 [Ryser, G. K.], 2867

 Sachs, L., 2556, 2572
 Sadd, J., [2817], 2823
 Saito, T., 2674
 Sakai, B., 2747
 Sakai, K., 2723
 Salmon, E. S., 2894
 Salonen, A., 2423
 Sampayo, T. J. Mello, *see* Mello-Sampayo, T. J.
 Sanchez-Monge Parellada, E., 2564
 Sanclemente Pineda, M., 2888
 Sandal, P. C., 2769
 Sanjiva Rao, B., 2722
 [San Martini, F.], 2530
 Santhanam, V., 2820
 Sarachek, A., 2446
 Sarkirjanov, S. Š., 2469
 Sasaki, M., 2566
 Sato, D., 2353
 Sato, I., 3110
 [Savitsky, H.], 2867
 [Savitsky, V. F.], 2867
 Sawada, K., 3102
 Sax, K. B., 2346
 Sayre, C. B., 3119
 Scarascia, G. T., 2878
 Ščepotjev, F. L., 2957
 Scott, D. H., 2975
 Schad, C., 2536, 2959
 Schanderl, H., 2432
 Schaper, P., 2801
 Schell, H., 2509
 Scherr, G. H., 2454
 Schmalz, H., 2577
 Schmidt, J. W., 2597
 Schmidt, M., 2947
 Schober, K., 2526
 Scholes, M. A., 2371
 Schröck, O., 3006
 Schultz, E. F., 2760
 [Schultz, J.], 2345
 Schulze, E., 2779
 Schussnig, B., p. 657
 [Schuster, M. L.], 2867
 Schwartz, D., 2656
 Seeborg, E. F., 2584
 Seitz, F. W., 2997
 Selman, G. G., 2361
 Sen, N. K., 3078
 Serr, E. F., 2960
 Šestakov, V. E., 2578
 Shah, G. L., 3018
 Shah, Siraj-ud-Din, *see* Siraj-ud-Din Shah
 Shakudo, K., *see* Syakudo, K.
 Shands, H. L., 2670
 Shapiro, S. K., 2405
 Shay, J. R., 2942
 Sheffner, A. L., 2447
 Shigemura, T., 2726
 Shimamoto, T., 2297
 Shimotomai, N., 3027
 Shirky, S. B., 2494
 Shrikhande, S. S., 2303
 [Shull, G. H.], p. 669
 Siebenga, J., 2802
 Silow, R. A., 2632, 2701
 Silva, A. R. da, 2545, 2608
 Silva, M. Vianna e, 2703
 Simmonds, N. W., 2978
 Simons, M. D., 2614
 Singh, C., 2837
 Singh, R. N., 2965
 Singh, U. P., 3040
 Singleton, W. R., 2368
 Sinjuhin, A. M., 2334
 Siraj-ud-Din Shah, 2830
 Skaare, S., 2510, 2542
 Skinner, J. C., 2324
 Slonimski, P. P., 2431
 Slović, D., 2926
 [Smith, C. H.], 2867
 Smith, F. O., 2980
 [Smith, H. H.], p. 670
 Smith, W. E., 2541
 Snee, J., 3042
 Snyder, E., 2986
 Solignat, G., 2959
 Sosa-Bourdouil, C., 2338
 Soubiès, L., 2658
 Sparrow, A. H., [2345], 2368
 [Spence, J. R.], 2817
 [Sprague, G. F.], p. 673
 Spurr, A. R., 3047
 Squibbs, F. L., 3041
 Squillace, A. E., 3012
 Srinivasamurthy, T., 2700
 Srinivasan, V. K., 2967
 Stadler, L. J., 2631
 Stakman, E. C., 2417, [2502]
 Stanton, T. R., 2611
 Stanton, W. R., 2424
 Stapleton, G. E., 2409
 Stent, G. S., 2460
 Stern, F. C., 2343
 Stern, K., 3006
 [Stern, K. G.], 2345
 Stevenson, B., 2694
 [Stewart, D.], 2867
 [St. John, G. A.], 2867
 Stokes, I. E., 2698
 Stone, W. S., 2410, 2413
 Stoner, W. N., 3065
 Storey, W. B., 2963
 Stout, G. L., 2944
 Strauss, B. S., 2427
 Subrahmanya, R. S., 2722
 Subramaniam, M. K., 2444–5
 Sugihara, Y., 3004
 Sunaga, S., 2479
 Suneson, C. A., 2538
 Svensson, V., 3020
 Swenson, S. P., 2910, 3113
 Syakudo, K., 2718–20

 Tabuse, Z., 3045
 Taft, E. B., 2347
 Tainio, A., 2472
 Takahashi, M., 2707–8
 Takashima, S., 3056, 3059
 Takasima, S., *see* Takashima, S.
 Tápke, V. F., 2685
 Tapley, W. T., 3119
 Tanaka, A., 3027
 Tarakanov, K. N., 2575
 Targioni Tozzetti, G., p. 663
 Tatebe, T., 3030
 Taylor, G. S., 2665
 Taylor, J. H., 2354
 Ternovskii, M. F., 2883
 Tesar, M. B., 2755
 Tesdorff, H., 3001
 Thieret, J. W., 2678
 Thijn, G. A., 2784
 Thirumalachar, M. J., 2798
 Thomas, I., 2593, 2604
 Thomas, M., 2731
 Thomas, P. H., 2930
 Thompson, N. R., 2782
 Thorpe, H. C., 2552
 Throckmorton, R. I., 2582
 Tihvinskja, V. D., 2881
 Timonen, S., 2362
 Tkačenko, F. A., 3052
 Tochinai, Y., 3102
 Toda, M., 2705
 Tolbert, N. E., 2313
 Tomes, M. L., 3070
 Tometorp, G., 3016
 Tominaga, M., 2718
 Topčiev, A. V., 2332
 Totsu, T., 2565
 Totu, T., *see* Totsu, T.
 Toxopeus, H. J., 2800
 [Trentin, A.], 2530
 Trombly, H. H., 3077
 Truhinova, A. T., 2569
 Trumble, H. C., p. 665
 Tryon, R. M. (Jun.), p. 661

- Tschermak-Seysenegg, E., 2500
 Tulpule, S. H., 2653
 Tupicyn, D. I., 2945
 Turk, A., 2419
 Turrill, W. B., p. 661
 Tverskoĭ, D. L., 2516
 [Tydeman, H. M.], 2923

 [Ulrich, A.], 2867
 Utiger, H., 2418

 Vaarama, A., 2921
 Valdeyron, G., 2553
 Valle, O., 2576
 [Vallega, J.], 2502
 van Beekom, C. W. C., 3036
 [Vargas, C., C.], 2502
 Vasconcellos, J. de C. e, 2699
 Vasin, M. G., 2559
 Vasudeva Murthy, A. R., 2722
 Veijola, T., 2581
 Veksler, A. I., 2471
 Venkataramani, K. S., 3091
 Venkataratnam, L., 2925
 Venot, P., 2959
 Vestad, R., 2738
 [Villamil García, F.], 2502
 [Vilmarin, M. de], 2530
 Vincent, A., 2600
 Vinogradov, P. I., 3072
 Vituškina, I. V., 2954
 Vjazov, O. E., 2335
 Volyneć, O. S., 2900
 von Baer, E., 2592

 Wagner, M. N., 2562
 Wagner, S., 2549, 2554
 Wakankar, S. M., 2819
 [Walker, A. C.], 2867
 Walker, J. C., 3064
 Wallis, W. A., 2309
 Watson, J. D., 2391
 Weaver, R. H., 2454
 Webb, M., 2365
 Webber, J. M., 2851
 Weigle, J. J., 2391
 [Weiss, L.], 2345
 [Wellhausen, E. J.], 2502, p. 673
 [Went, F. W.], 2867
 [Whaley, W. G.], p. 669
 Wheeler, E. J., 2782
 Whistler, R. L., 2659
 Whitaker, T. W., 3051
 White, C., 2308
 [Whitehouse, R. N. H.], 2462
 Whyte, R. O., p. 665
 Wickens, G. M., [2817], 2835
 Wiersema, H. T., 2793
 Wiles, A. B., 3064
 Wiles, A. E., 2430
 Wilkinson, J., 2352, 2877
 Willcox, O. W., 2860
 Williams, A. H., 2728
 Williams, J. H. (Jun.), 2539
 Williams, R. C., 2385
 Willis, J. L., 2999
 [Wilson, D. J.], 2923
 Wilson, M. C., 2753-4
 [Winters, L. M.], p. 672
 Woll, E., 2374
 [Wood, R. R.], 2867

 Woodward, R. W., 2678
 Woodworth, C. M., 2649
 Wright, G. M., 2909
 Wright, J. W., 2993
 Wright, S., 2325
 Wunderlich, G., 3120
 [Wyatt, G. R.], 2345
 Wyckoff, R. W. G., 2342
 Wyss, O., 2410, 2413

 Yamada, T., 2579
 Yamaguchi, M., 3022, 3047
 Yamamoto, K., 2675
 Yamamoto, T., 2676
 Yamane, Y., 3057
 Yamaura, A., 2730
 Yamazaki, W. T., 2583
 Yanofsky, C., 2408
 Yarnell, S. H., 3124
 Yasui, K., 2340
 Yoshida, S., 2710
 Yoshii, H., 2725
 Youngner, V. B., 3058
 Yudkin, J., 2411

 Zdriljko, A. F., 2590
 Zerpa, D. M. de, 2743
 Židko, E. P., 2841
 Zink, F. W., 3047
 [Zirkle, C.], p. 668
 Zobel, B., 3002
 Zuber, M. S., 2647
 Zubkov, I. A., 3066
 Žukovskii, P. M., 2651
 Zweifel, J., 2684

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